

## THE CARBONIFEROUS TRILOBITES OF AUSTRALIA.

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(Plates xlv.-liii.)

## INTRODUCTION.

For many years, my collection has contained a number of Carboniferous Trilobites new to science. When the opportunity of describing them presented itself, my first intention was to confine myself to these specimens. On subsequent consideration, it occurred to me that palæontological knowledge would be increased by extending the scope of my paper so as to embrace all previous work on the Carboniferous Trilobita of Australia, to describe all new forms that might be available from other sources, and review, re-describe, and redetermine, where it might seem necessary, those species referred to by previous authors. It will be found, in the course of this paper, that, in a number of instances, my views are widely divergent from those of previous authors; and, while regretting this divergence, it has not arisen through rashness or want of reflection on my part; and I may candidly affirm that my inability to reconcile the determinations of previous authors with my own, in some cases, was the only unpleasant part of the work expended on this paper. My aim is to clear the literature on the Australian Carboniferous Trilobita, to date, of errors which have undoubtedly become incorporated therein. This aim is one not likely to be fully realised, but it will be my endeavour at least to lessen them, and, if I succeed in doing this, I shall be satisfied. That the present paper is free from errors is not one of my expectations, for with reference to my conclusions in respect to *P. woodwardi*, I am not by any means satisfied; and I shall await with some anxiety, the discovery of better petrifications of the remains of this species, to make certain what its complete form actually was.

The discovery of the genus *Brachymetopus* in the Mount Morgan district will be of much assistance in establishing the geological age of that area, and also in correlating its sedimentary rocks with those of other localities. For reasons which will be obvious, the name *Phillipsia dubia* has been discarded by me.

To Messrs. W. S. Dun, Palæontologist, Department of Mines, Sydney, B. Dunstan, Chief Government Geologist, Brisbane, and H. A. Longman, Director of the Queensland Museum, Brisbane, I am indebted for specimens placed with me for inspection and description, and for which I tender to them my thanks. To Mr. R. Etheridge, J.P., Director and Curator of the Australian Museum, and to Mr. Dun, my thanks are tendered for affording me access to literature. I am very grateful to General A. W. Vogdes, of San Diego, U.S.A, Bibliographist and Authority on Palæozoic Crustacea, for supplying me with notes on the classification, and a list of the Carboniferous Trilobites described to date. Lastly, I wish to express my thanks to Mr. F. R. Cowper Reed, M.A., F.G.S., Acting Keeper of the Sedgwick Museum, Cambridge, England, for supplying me with a number of his valuable papers, from which I have received much help.

#### BIBLIOGRAPHY OF AUSTRALIAN CARBONIFEROUS TRILOBITES.

(1).—1847. Prof. McCoy (Ann. Mag. Nat. Hist., xx., p.231, Pl. xii., fig.1) described *Brachymetopus strzeleckii* and referred to the occurrence of the genus *Phillipsia* in Australian Carboniferous rocks.

(2).—1872. R. Etheridge, Senr., (Quart. Journ. Geol. Soc., Vol. xxviii., p 338, Pl. xviii., fig.7) described *Griffithides dubius*, which, from the description, would appear to be an abnormal species.

(3).—1877. De Koninck (Foss. Pal. Nouv. Galles du Sud, Pt. 3, p. 348, etc., Pl.24, figs. 8, 9, 9a, 10, 10a, 10b, and 10c) described and figured *Griffithides* (*Phillipsia*) *eichwaldi* Fischer, *Phillipsia* (*Griffithides*) *seminifera* Phillips, and *Brachymetopus strzeleckii* McCoy.

(4).—1892. R. Etheridge, Junr., (Geol. and Pal. Queensland and New Guinea, pp. 214-216, Pl. xxi., figs.11-14; Pl. viii., figs.

5, 6; and Pl. xl., figs. 4, 5, 6) described the following:—*Phillipsia dubia*, *P. woodwardi* Eth. fil., *Phillipsia*(?) sp. ind., for which he suggested the specific name *Griffithides seminiferus* var. *australusica*, from Queensland. Also in the same year [Mem Geol. Surv. N. S. Wales, Pal., No.5, Pt. ii., pp.126-130, Pl. xxi., figs. 1-4, 5 (and Text-fig. 5), 6, 7, 8; Pl. xxii., figs.12-15], the same author described *Phillipsia dubia*, *P. grandis*, *Phillipsia* spp. ind. (two, *a* and *b*), and *Griffithides*, sp. ind.

(5).—1903. F. R. C. Reed, M.A., F.G.S. (Geol. Mag., Dec. iv., Vol.x., No.467, pp.193-197) redescribed *Brachymetopus strzeleckii* McCoy, and added valuable remarks on its generic and specific position.

(6).—1917. R. Etheridge, Junr., (Geol Surv. of Queensland, Publication No.260) made additional reference to the occurrence of *Phillipsia grandis* in Queensland.

(7).—Besides the above descriptions and determinations, R. Etheridge, Junr., referred a fragment of a pygidium from West Coerdawandy and the Yaltra Mtns., on the Gascoigne River, West Australia, to his species *Phillipsia grandis* (MS.).

## CRITICAL REVIEW OF THE CARBONIFEROUS TRILOBITES OF AUSTRALIA, PREVIOUSLY DESCRIBED.

### Order **TRIOBITA**.

#### Family PROETIDÆ.

#### Genus BRACHYMETOPUS McCoy, 1847.

1. BRACHYMETOPUS STRZELECKII McCoy, Ann. Mag. Nat. Hist., xx., 1847, p.231, Pl. xii., fig.1.

Since this species was described by McCoy, no specimens of it, or of any other member of the genus, appear to have been found by collectors, though on the occasion of the first find at Dunvegan, N. S. Wales, quite a number seem to have been obtained.

#### Genus PHILLIPSIA Portlock, 1843.

To Prof. McCoy we owe the first reference to the occurrence of this genus in Australia (*loc. cit. antea*).

2. *PHILLIPSIA EICHWALDI* De Kon., (non *P. eichwaldi* Fischer) Foss. Pal. Nouv. Galles du Sud, 1877, Pt.3, p.348, t.24, f.9.

Under the name of *Griffithides (Phillipsia) eichwaldi*, De Koninck described a trilobite from Colo Colo, N.S.W., and determined it to be *P. eichwaldi* Fischer; but, as the writer points out further on, this determination was evidently incorrect. Mr. Etheridge, Junr., expressed a similar view (Etheridge, Junr., Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, p.124). There is little doubt that the presence of this trilobite in Australia remains yet to be established.

3. *PHILLIPSIA DUBIA* Etheridge, Junr., (non *Griffithides dubius* Etheridge, Senr.) Geol. and Pal. Queensland and New Guinea, 1892, pp.214-215, Pl. vii., fig.5; Pl. xlv., fig.4.

*Phillipsia dubia* Etheridge, Junr., (non *Griffithides dubius* Etheridge, Senr.) Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, p.126, Pl. xxi., figs.1-4, Pl. xxii., figs.12, 13.

The above two forms were considered by Mr. Etheridge, Junr., to be specifically identical with *Griffithides dubius* Etheridge, Senr.; and the latter to be generically misplaced. The writer regrets that, with this determination, he cannot agree with Mr. Etheridge. It appears to him that neither of the above trilobites is specifically identical with *Griffithides dubius* Eth. Senr., nor with each other. Mr. Etheridge, Junr., when describing the trilobite from Binge Berry, Rouchel Brook, New South Wales (*loc. cit. antea*) pointed out that it differed from the Queensland form in having eighteen to twenty axial rings in the pygidium instead of eight to ten, which is the number in that of the Queensland form. This alone is sufficient to separate them specifically; but the head-shields of the two also differ. Both forms are here treated as separate species. The writer's view regarding the Queensland *Phillipsia dubia* is, that it cannot at present be generically or specifically joined with *Griffithides dubius*; and that the latter species must still be recognised. Only the discovery of a number of specimens of this form, showing the stages of development from the immature to the mature state, can satisfactorily establish the proper position generically and specifically of *Griffithides dubius* Eth. Senr.



4. *PHILLIPSIA GRANDIS* Etheridge, Junr., Geol. and Pal. Queensland and New Guinea, 1892, p.215. Etheridge, Junr., Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, Text-fig.5, and Pl. xxi., fig.5. Etheridge, Junr., Geol. Surv. Queensland, Publication No.260, pp.11-12, Pl. iii., fig 3.

It is unfortunate that Mr. Etheridge placed these two forms specifically together. They are quite different, and are so treated by the writer. In describing them, their differences will be fully shown. As the Queensland form was the one for which the specific name *grandis* was first suggested by Mr. Etheridge, it is proposed that it should continue to be known by this name. To the New South Wales one, a new specific term will be given.

The name *grandis* is quite appropriate for either of the forms; because their pygidia are larger than those of any other known Carboniferous trilobite.

5. *PHILLIPSIA WOODWARDI* Etheridge, Junr., Geol. and Pal. Queensland and New Guinea, 1892, p. 215, Pl. 7, figs.11, 13; Pl. 44, figs. 5, 6.

This is a singular species, to which some reference will be made later on.

6. Besides the foregoing species of *Phillipsia*, which have been specifically determined, Mr. Etheridge described two pygidia from Binge Berry, Rouchel Brook, and near Paterson, respectively, and referred them to this genus, but did not give them specific rank.

7.(a) *PHILLIPSIA* sp. ind. (a), Etheridge, Junr., Mem. Geol. Surv. N. S. Wales, Pal. No. 5, Pt. ii., 1892, p.129, Pl. xxi, figs. 6-8.

(b). *PHILLIPSIA* sp. ind. (b), Etheridge, Junr., *op. cit.*, p. 129, Pl. xxii., fig.14.

Both of these will be redescribed and named.

#### Genus *GRIFFITHIDES* Portlock, 1843.

8. *GRIFFITHIDES DUBIUS* Etheridge, Senr., Quart. Journ. Geol. Soc., 1872, xxviii., p.338, t.18, f.7.

The writer is of the opinion that this species should still be recognised. Its description is the first record of the genus in Australian rocks.

9. GRIFFITHIDES SEMINIFERUS De Koninck (*non* Phillips, species) Foss. Pal. Nouv. Galles du Sud, 1877, Pt.3, p.348, t.24, f.9, 9a.

That this determination on the part of De Koninck was incorrect, there is really no doubt. It is fully dealt with in the observations on the relationship of *Phillipsia collinsi* to other species, described further on.

10. GRIFFITHIDES SEMINIFERUS var. AUSTRALASICA Etheridge, Junr., Geol. and Pal. Queensland and New Guinea, 1892, p.216, Pl. vii., fig.14.

The material used by Mr. Etheridge for his description of the above is before me, and, after close examination of it, I am doubtful of the correctness of Mr. Etheridge's conclusions. The pygidia, by which his conclusions were greatly influenced, have each thirteen and eleven axial and pleural divisions respectively; and, in this respect, agree with pygidia placed by me with his *P. woodwardi*. All these pygidia agree in their ornamentation. As regards the cephalon associated on the specimen with these pygidia, it does not appear to differ in any essential from two of those included by Mr. Etheridge in his *P. woodwardi*, except that, in the latter, the granulation has been worn off by weathering. On the glabella of the former, it is true, no anterior or mesial glabellar furrows are visible, but this glabella is a very imperfect intaglio. If it should ultimately be shown that this fossil is a good species, it will not, even then, be closely related to *Gr. seminiferus*, because it possesses supplementary basal lobes, and the latter does not. This difference certainly places them specifically apart. It may be stated that, so disposed was I to the opinion that this was a separate species, that I had written a description of it under a new name, but not being able to discern any difference in the pygidia now under discussion, and those I have placed with *P. woodwardi*, I deferred final judgment.

11. *GRIFFITHIDES SWEETI* Etheridge, Junr., Proc. Linn. Soc. N. S. Wales, 1894, p.528, Pl. xxxix., f.3.

The writer has not seen the original specimen. Judging from the description and illustration, it is a very unusual type. See description further on.

12. *GRIFFITHIDES* sp. ind., Etheridge, Junr., Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, p.130, Pl. xxii., figs.15, 16.

It is not improbable that this may be identical with *Phillipsia collinsi*.

From the foregoing review, the following conclusions have been drawn, viz.:—

i. That, of the nine species of Australian Carboniferous trilobites previously described and named, only the five following are worthy of recognition.

1. *Brachymetopus strzeleckii* McCoy.

2. *Griffithides dubius* Eth. Senr.

3. *Griffithides sweeti* Eth. Junr.

4. *Phillipsia woodwardi* Eth. Junr., Geol. et Pal. Queensland and New Guinea, p.215, Pl.7, figs.11, 13.

5. *Phillipsia grandis* Eth. Junr., of which the type is the Mt. Morgan form. Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, p.128, Pl. xxi., fig.5.

ii. That the two determinations made by the late Prof. De Koninck are incorrect, and scientifically valueless.

#### Family PROETIDÆ Steinb.

Genus *PHILLIPSIA* Portlock, 1843.

Dr. H. Woodward's\* description of the genus is as follows:—  
“General form oval; glabella with nearly parallel sides, marked by either two or three pairs of short lateral furrows; the posterior angles, forming the basal lobes, always separated by a circular furrow from the rest of the glabella; eyes large, reniform, surface delicately faceted; cervical furrow deep; free cheeks separated from the glabella by the axial (facial) suture, which forms an acute angle with the circular border of the cheek in front of the

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\* Mon. Brit. Carb. Trilobites, 1883-4, p.11.

glabella; whilst the facial suture cuts obliquely across the posterior margin, just behind the eye, leaving a small pointed portion fixed to the glabella by the neck lobe; angles of the cheeks more or less produced, margin of head incurved, forming a striated and punctured rim. Thoracic segments nine in number, the axis distinctly marked off from the side-lobes or pleuræ by the axial furrows; the abdomen or pygidium usually with a rounded border, the axis composed of from 12 to 18 coalesced segments."

PHILLIPSIA COLLINSI, sp. nov.

(Pl. xlv., figs. 1-5; Pl. xlviii., figs. 8, 9; Pl. lii., fig. 4).

*Sp. Chars.*—Complete form elongately ellipsoidal.

*Cephalon* sub-semielliptic, moderately inflated, densely tuberculated; glabella sub-oblong or sub-bellshaped, narrow, upper surface flat, steep and straight-sided, densely crowded with prominent tubercles of variable sizes; medially the tubercles are arranged in four sublongitudinal rows, those on the anterior part are subconcentric; front gently rounded and bearing a concentric row of tubercles; lateral lobes and furrows distinct, the basal pair altogether circumscribed, and bearing a varying number of tubercles, one usually much larger than the others; limb narrow, with a gentle upward turn, smooth or very finely granulate; neck-furrow distinct, narrow, and deep behind the basal lobes; neck-ring strong, moderately arched and tuberculate, its lateral extensions being narrow; fixed cheeks very small, eye or palpebral lobes bounded by tubercles; eyes apparently crescentic; free cheeks unknown. Axial furrows distinct; facial sutures anteriorly very gently sinuate (almost straight) and close to the axial furrows; posteriorly straight, and almost at right angles to the axial line, and at last cutting the fixed cheeks with a sharp backward turn.

*Thorax* oblong, moderately inflated and granulated; axis prominent, the rings centrally and at the bases mildly curve forward; bases feebly tuberculated, width equal to that of one side-lobe, median sulci of the rings narrow; pleuræ convex, medial furrows of each segment wide and shallow, and reaching the distal end,

which is rounded; each posterior segmental ridge bears a row of tubercles, as do also the axial rings; axial furrows distinct.

*Pygidium* semi-ellipsoidal, moderately tumid and strongly tuberculate; proportion of length to width equals 3:4 approximately; axis has fourteen rings, prominent, dorsally depressed, sides steep, contracting very gradually posteriorly to about half the anterior width, terminating bluntly and somewhat overhanging the border, the rings bearing tubercles which vary in number with their spread from two or more on the posterior ring, to eight on the anterior ones, and not exactly forming longitudinal rows; axial furrows pronounced; pleuræ very convex, arching from the axial grooves at first gently and then steeply to the narrow furrow separating them from the border, where all the segments, except the anterior pair, end, segments ten in number, each succeeding one having a gently backward trend, and diminishing in length till the last two pairs are represented by mere tubercles. Each segment bears a row of tubercles along the posterior ridge varying in number with its length, from one to ten, and perhaps in some instances more; medial segmental furrows wide and shallow, reaching to the faint furrow within the border; the border itself is fairly wide, and thickened, and, in normal specimens, has the same convexity as the pleural ribs; it bears a row of conspicuous tubercles usually placed in line with each rib, and three to five behind the axis, these tubercles being occasionally elongated or double; when the thickened portion is removed, the undersurface shows concentric striations, which is a common feature in the Proetidae. Only the first pair of the pleural segments interrupts the continuity of the border.

*Obs* — This species is quite singular. Its outstanding features are:—1. The narrow, straight-sided glabella. 2. The crowded and conspicuous tuberculation of the glabella. 3. The equality of the lengths of the pygidium and thorax. 4. The width of the thorax, which equals half the total length of the complete individual. 5. The closeness of the eyes to the axial groove. 6. The straightness of the anterior branches of the facial sutures, and their parallelism to the axial furrows.

Dimensions: total length of an individual not quite mature,

one inch; width, half an inch; cephalon, one-quarter inch; thorax and pygidium, each three-eighths of an inch.

In the proportions of length to width, and the character of the pygidial granulation, this trilobite agrees with *P. gemmulifera* Phillips, with which it also agrees in the equality of the lengths of the thorax and pygidium. In other specific features, they differ. In the cephalons and pygidia of *P. collinsi* and *P. truncatula*, there is much common to the two. They agree in possessing narrow, straight-sided and tuberculate glabellæ, eyes close to the axial furrows, and similarly tuberculated pygidia; but the tuberculation on the glabella of the former is much more pronounced than it is on the latter, and the sinuate course of the anterior branches of the facial sutures of the latter is more pronounced than that of the former. The pygidium of *P. truncatula* has seventeen or eighteen annulations in the axis, and fourteen divisions in each pleura; but in *P. collinsi*, these parts number fourteen (or thirteen and a terminal piece), and ten respectively. In the former, the pygidium has no border, and the pleural ribs extend to the periphery; on the other hand, the latter species has a very distinct pygidial border, which, except in the case of the anterior pairs, the pleural ribs do not cross. The tubercles of the pygidial axis of the former are arranged in longitudinal rows; this is not quite so with those of the latter. Of the North American Phillipsiæ, the nearest relative to ours appears to be *P. insignis*, which apparently has the same number of divisions in the axis and pleuræ of the pygidium, as are in the similar parts of *P. collinsi*. The tuberculation of the axial rings is much alike in the two species. In other respects, they differ rather widely. The only Australian Carboniferous trilobite fragments bearing any resemblance to *P. collinsi* are two pygidia described and figured, but not named, by Mr. Etheridge, Junr.\* The one pygidium he placed in the genus *Phillipsia* (*loc. cit.*, Pl. xxii., fig. 14). It agrees with *P. collinsi* in possessing fourteen rings in the pygidial axis, and in having a tuberculate test; but differs in having a continuous, smooth, flattened border, and

\* R. Etheridge, Junr., Mem. Geol. Surv. N. S. Wales, Pal. No. 5, Pt. ii., 1892, pp. 129-130, Pl. xxii., figs. 14, 15.

twelve pleural segments, and less disparity between length and width of the pygidium.

The pygidium (*loc. cit.*, Pl. xxii., fig. 15) placed by Mr Etheridge in the genus *Griffithides*, bears a resemblance to the present species in the character of its border and granulation, and in having the same number of pleural segments; but its axis has less rings, and ends in a sharp point.

Lastly, referring to De Koninck's *P. (Griffithides) seminifera* (*non* Phillips sp.)\* from Colo Colo. The dimensions, number of rings in the axis of the pygidium, character of the granulation generally on the pygidium and thorax agree closely with similar features of *P. collinsi*; but the two forms widely differ in the outlines of their glabellæ and pygidia, if De Koninck's figures are to be relied upon, which is doubtful, as they do not agree with the text. In the former, the glabella is represented as being conical in outline; and, in the latter, it is said to have an anterior width slightly less than that of its base. Whatever *Phillipsia (Griffithides) seminifera* De Koninck, may have been, it is practically certain it was not *Griffithides seminiferus* Phillips; but it may have been identical with the present species.

Named after Mr. Collins, C.C.M., Lecturer in Coalmining and Mine Surveying at the Newcastle Technical College.

*Loc. and Hor.*—Glen William Road, one mile from Clarentown, Parish Parr, County Durham. Lower(?) Carboniferous.

PHILLIPSIA COULTERI, sp. nov.

(Plate xlv., figs 6-10).

*Sp. Chars.*—Complete form subelliptic.

*Cephalon* sub-semielliptic, fairly inflated, finely granulated; glabella subrectangular, rounded in front, lateral furrows and lobes not visible, owing to the loss of the part bearing them, and the exposure of the hypostome; neck-furrow shallow, its lateral extensions across the cheeks shallow and wide; neck-ring narrow; axial furrows faint. Fixed cheeks small. Free cheeks relatively large, strongly inflated, steep between the eye and border-furrow, which is wide and shallow, outer edge of border only moderately

\* Pal. Foss. Nouv. Galles du Sud, 1877, p. 267, Pl. xxix., figs. 9, 9a.



thickened. Eyes prominent, large, crescentic and faceted. Genal angles rounded. Hypostome alate, shield like, and striated in the fashion common to *Phillipsiæ*.

*Thorax* 11 mm. wide and 9 mm. long, appearing to have been finely granulated, with a few scattered tubercles; straight-sided. Axis very strongly and acutely arched, rings, centrally and basally, strongly inclined anteriorly, each one bearing along the medial line a rather prominent tubercle, giving the axis throughout a serrated character; spread equal to that of one side-lobe, mildly tuberculate, height and width diminishing gradually posteriorly, axial grooves faint. Pleuræ gently rising from the axial grooves to the fulcræ, thence steeply deflected, mesial furrows of the somites shallow and wide, and reaching the extremities, which are rounded; along the fulcral line each rib bears a tubercle on the posterior ridge, and there is evidence of the presence of general fine tuberculation or granulation.

*Pygidium* semielliptic, length 8 mm., width 10 mm. Axis very prominent, the first ring having a medial forward trend, rings eight or nine, counting the end-piece, which is buttress-like, and ends at the border in a rather fine point, and bears a subconspicuous tubercle. Pleuræ with seven divisions, all rather inconspicuous in the specimen (decorticated) serving for this description, moderately convex; mesial furrows very shallow and reaching to the faint furrow within the border, each segment bearing a tubercle at the fulcral angle, and showing traces of other tuberculation, as do also the axial rings; the border is relatively wide, steep, gently thickened, and bounded inwardly by a faint furrow, and is crossed only by the first pair of ribs.

*Obs.*—Though the glabellar furrows and lobes are not visible in the specimen described, the shape of the glabella and character of the hypostome leave no doubt as to its being a *Phillipsia*, and the specimen is one of the finest of this genus yet discovered in Australia. It differs so widely from other Australian species that there is no need to detail its relationship. It bears no close relationship to any of the American *Phillipsiæ* referred to in Brigadier General A. W. Vogdes' Monograph.\*

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\* "The Genera and Species of North American Carb. Trilobites," Annals N. Y. Acad. Sci., 1888, vi.

The species has been named after Mr. E. Coulter, of Katoomba, an enthusiastic student of geology, who discovered and presented the specimen to the author.

*Loc. and Hor.*—Stroud-Dungog Road, near Dungog, Parish Howick, County Durham. Lower Carboniferous.

PHILLIPSIA BREVICEPS, sp.nov.

(Plate xlv., figs. 11, 12; and Plate li., fig. 2).

*Sp. Chars.*—Complete form unknown.

*Cephalon* apparently subsemicircular, finely granulated. Glabella straight-sided, rounded in front, very gently convex, highest just in front of the neck-furrow, smooth, though a lens shows evidence of microscopic granulation, two pairs of lateral furrows visible, basal and mesial. The former very shallow and circumscribing the basal lobes, which are large and pyriform; the other narrow; neck-furrow narrow and shallow; neck-ring relatively wide, decidedly arched backwardly and lobed at its bases; frontal limb narrow and gently recurved. Fixed cheeks very small, eye-lobes small, and abutting the axial furrows. Facial sutures anteriorly rather straight and close to the axial furrows; eyes of moderate size only, judging by the size of the palebral lobes.

*Thorax* unknown.

*Pygidium* sub-semielliptical, moderately convex, very finely granulated; width 10 mm., and length 7 mm. respectively. Axis prominent, consisting of thirteen rings, and a very narrow end-piece, spread equal to that of each side-lobe, contracting very gradually posteriorly, and terminating short of the border, rounded and bluntly, with half its anterior width; some of the rings bear very fine tubercles, barely distinguishable without the aid of a lens; side-lobes moderately convex, with ten, or doubtfully eleven, pairs of segments, of which the medial furrows are distinct, and, in the case of the four anterior pairs, at least reach the edge and interrupt the narrow border; a few of the posterior segments bear very small tubercles at their junction with the border, and three similar tubercles occur behind the axis, on the axis itself centrally the posterior ridges also bear fine tubercles.

*Obs.*—As will be apparent from a comparison of the above description with that of *P. derbiensis* Martin, the two fossils agree in several important features. For example, in both the glabella is parallel-sided and practically smooth, anterior facial sutures rather straight and close to the axial furrows, eyes reniform, pygidial axis with thirteen rings, and ten segments in the pleuræ; and the pygidial borders obsolescing before reaching the articulating face; in the equality of maximum widths of the axes and pleuræ of the pygidia (this is only true in the case of the above species when the pleuræ are measured obliquely, and not the actual horizontal widths; if measured in the latter way, the axis is wider than one pleura) and the faint tendency to ornamentation on these parts. Against these resemblances, there are the following differences to be considered. The length of the glabella of the local species, measured from the neck-furrow to its front, is equal to its width between the axial furrows across the basal lobes; in that of *P. derbiensis*, these dimensions are respectively about 4 : 2. The eye-lobes are shorter, and the frontal border wider, neck-ring more intensely arched posteriorly in the local form than in the British one. The distinct lobation of the bases of the neck-ring, relatively short cephalon, and the almost equality of the lengths of the cephalon and tail are very marked features in the local species, separating it from the other. Then there is the distinct, though fine, granulation, more or less tuberculation of the pygidium of the form now described, as against a practically smooth one in the other. Further, judging from the anterior pair of pleural segments of the pygidium, the thoracic pleural ribs were not imbricated, in the case of the local species. Although undoubtedly closely related to each other, I have concluded that the differences between them are sufficient to justify their separation specifically.

The glabellæ of the above species and *Proctus missouriensis* are much alike. I am indebted to Brigadier General Vogdes' paper (*op. cit.*, *antea*) for the references made to American Carboniferous trilobites.

*Loc. and Hor.*—Neighbourhood of Port Stephens, probably from near Bulladelah. Carboniferous.

## PHILLIPSIA PROXIMA, sp.nov.

(Plate xlv., figs. 15, 16).

*Sp. Chars.*—*Pygidium* semielliptical, fairly convex, practically smooth, so fine is the granulation. Length 12 mm., width 15 mm. Axis strongly convex, rings twenty, tapering posteriorly very gradually, and ending bluntly at the border, with a spread of about half that of the anterior ring; axial furrow shallow, but distinct. Pleuræ gently convex, consisting of twelve pairs of ribs, the last one or two very short and faint, all terminating at the border, which is continuous to the articulating face and sub-depressed; medial furrows of the segments, except in the cases of a few of the posterior pairs, well defined, anchylosing ridges also fairly prominent; furrow separating border and pleural ribs distinct.

*Obs.*—This pygidium agrees with that of *Phillipsia eichwaldi* Fischer, in the continuous smooth and somewhat depressed border, and the character of the pleural segments. The most important differences between them are—(1) the pygidium of *P. eichwaldi* is just as wide as long, is distinctly granulated, and the distal axial end does not seem to be prominent. The pygidium above-described has a length only four-fifths of its width, and is practically smooth. The total length of the pygidia of mature individuals of the former, as shown by the beautiful figures in Dr. H. Woodward's work\* is 9.5 mm., that of the latter is 12 mm. The large number of rings in the axis of ours places it far apart from the other. Named because of its close resemblance to *P. eichwaldi* Fischer, in shape.

*Loc. and Hor.*—Glen William Road, near Clarencetown, Parish Parr, County Durham. Lower Carboniferous.

## PHILLIPSIA(?) ROBUSTA, sp.nov.

(Plate xlvii., figs. 1 and 8).

*Phillipsia grandis* Eth. fil., Mem. Geol. Surv. N. S. Wales, No. 5, Pt. ii., 1892, p. 128, text-fig. 5 (*non* Pl. xxi., fig. 5).

*Sp. Chars.*—*Cephalon* and *thorax* unknown.

*Pygidium* subsemicircular, strongly convex, very finely granu-

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\* Mon. Brit. Carb. Trilobites, 1883-4, Pl. iv., figs. 9 and 13.

late, greatest width 44 mm., length 26 mm., (the width here given is what the writer considers to be the normal, and is calculated from the width of the left side-lobe and half the spread of the axis, because the right side-lobe is distorted). Axis fairly prominent, evenly arched without any decided backward or forward inclination of the annulations, of which there are fourteen; the furrows of these are wide and V-shaped in section, ridges high, edged, and bore some small tubercles, bases not tuberculate. Axial furrows shallow. Pleuræ very convex, arching strongly from the axial furrows, and showing no decided fulcræ; segmental divisions twelve pairs, which reach to the border, and are only gently directed posteriorly, except in the case of the last two pairs; their mesial furrows are V-shaped, wide, and reach to the border, ridges high and chisel-edged, and show no sutures, hence the pleural segments in this pygidium were very completely fused: some of the ridges exhibit evidence of very fine and sparse tuberculation, anterior pair faceted. Border continuous, wide, steep, and its undersurface concentrically striated.

*Obs.*—This pygidium was described and figured by R. Etheridge Junr.,\* and considered by him to be identical with a pygidial fragment from near Mt. Morgan, Queensland, and for which he had previously suggested the name *Phillipsia grandis*.† Mr. Etheridge figured this Queensland specimen, when dealing with some New South Wales trilobites.‡ The writer is unable to accept Mr. Etheridge's determination of the identity of these two pygidia, for the following reasons. 1. The part of the pleural lobe preserved on the Queensland pygidium shows fifteen segments, and, when complete, without doubt had several others, as against twelve in the New South Wales one. 2. Though the Queensland tail, when complete, was apparently longer than that of the New South Wales specimen, the greatest width of its pleural lobes was only 10 mm., as against 15 mm. for that of

\* Mem. Geol. Survey N. S. Wales, Pal. No. 5, Pt. ii., 1892, p. 128, text-fig. 5 (*non* Pl. xxi., fig. 5).

† Jack and Etheridge, Geol. and Pal. of Queensland and New Guinea, 1892, pp. 215, 216.

‡ Mem. Geol. Survey N. S. Wales, Pal. No. 5, Pt. ii., 1892, Pl. xxi., fig. 5.

the latter. 3. In the Queensland one, the pleural segments along the ridges are separated by very distinct sutures; in the other, this is not so. 4. In the Queensland one, the border is not nearly continuous, for the three anterior pairs of pleural segments reach to the edge of the lobes, and these are the only ones which are perfect on the portion of the left and pleural lobe of the specimen. 5. The mesial furrows and ridges of the pleural segments are not alike in the two. 6. In the Queensland tail, there were not less than sixteen or more axial rings, but fourteen only in that of the other. 7. The axial grooves are deeper in the specimen from Queensland, than in the one from New South Wales. The two agree in the character of their granulations; but that of the Queensland one is the coarser.

That the Queensland pygidial fragment represents a new species of either *Phillipsia* or *Griffithides*, there is no doubt; and, to it, my proposition is to apply the name *Phillipsia grandis*, first suggested for it by my friend, Mr. Etheridge.

*P. robusta* differs from all species of this genus, or of *Griffithides* known to me. Mr. Etheridge, too, noted (*loc. cit.*) how different it was from foreign Carboniferous trilobites.

*Loc. and Hor.*—Swain's Conditional Purchase, seven miles south-east of Carroll, County Buckland (D. A. Porter). Carboniferous.

PHILLIPSIA(?) STROUDENSIS, sp.nov.

(Plate xlv., fig.14; Plate li., fig.11).

*Sp. Chars.*—*Cephalon* and *thorax* unknown.

*Pygidium* semielliptic, densely and finely granulate, moderately convex; greatest width 17 mm., length 15 mm. Axis only moderately convex. Consists of twenty annulations, a few of the anterior of which have a very gentle forward inclination, centrally and basally; contraction posteriorly very gradual, terminating bluntly, and rounded at the border, with half the anterior width (3 mm.), medial furrows of the rings wide and shallow; anchylosing ridges not very prominent, but distinctly granulated, anterior spread slightly less than that of one side-lobe. Axial furrows faint. Pleuræ moderately convex, segments fifteen, the last faint, anterior pair faceted, all finely and



distinctly granulate, reaching to the border, and gently inclined backward (falcate). Medial furrows wide and shallow, reaching the border, ridges low. Border continuous, narrow anteriorly, gently increasing in width posteriorly, flat, densely and finely granulate.

*Obs.*—This is a fairly large pygidium, as the dimensions given will show; but it is, in this respect, exceeded by both of the forms placed by Mr. R. Etheridge Junr., under the name of *P. grandis*; but it has no specific relations with either of them. In the number of axial rings, it agrees with *P. elongata*, but not in other features. It is different from all the British *Phillipsia* the writer has been able to compare it with; and the same is true as far as the North American species are concerned.

*Loc. and Hor.*—Stroud, County Gloucester, N.S.W., associated with *Orthis resupinata* and *Spirifer striatus*. Lower(?) Carboniferous.

PHILLIPSIA SUPERBA, sp. nov.

(Plate xlviii., fig. 15; Plate lii., fig. 3).

Complete form unknown.

*Sp. Chars.*—*Cephalon* semicircular or very nearly so, microscopically granulate, practically smooth; length 6 mm., width just on double its length. Glabella subfiddle-shaped, or suboblong with a very gently rounded front, practically smooth, very slightly convex, and decidedly contracted at the middle; three glabellar furrows (doubtfully four), anterior pair or pairs very short, mesial pair falcate and very faint, posterior pair faint at their origin; inwardly wide and deep. Anterior and mesial lobes ill-defined, the latter indistinctly separated from the basal pair, which are small, reniform, and prominent, standing out from the posterior part of the glabella, like tubercles. Neck-furrow distinct, with a decided central and basal forward curve, its lateral extensions straight and well-defined, joining with the lateral furrows of the free cheeks within the genal angles. Neck-ring strong, convex, centrally and basally anteriorly inclined, bases also gently tuberculate; lateral extension narrow and not prominent. Axial grooves relatively narrow, deep, and sinuate. Limb narrow, with gently thickened and mildly raised margin. Facial sutures



anteriorly gently sinuate, and posteriorly shortly obliquely curved. Fixed cheeks very small, palpebral lobe almost linear, but convex. Free cheeks relatively fairly large, subdepressed, border wide, depressed; margin very slightly thickened, furrow shallow, linear; bands just within the border, and the similar bands under the shallow, wide furrows beneath the eyes, bear rows of granules. Genal angles apparently rounded. Eyes relatively large, reniform and faceted.

*Obs.*—This cephalon is clearly separated from all other known Australian Phillipsiæ. In the shape of the glabella and possibly in the possession of four glabellar furrows, relative size and situation of the eyes, it bears likeness to *P. eichwaldi*; but it differs from that species in having a nearly semicircular cephalon, rounded genal angles, and in the absence of distinct cephalic granulation, and of genal spines. Also, it resembles *P. derbiensis* Martin, in the form of the glabella, small free cheeks, and character of its facial sutures, small palpebral lobes, rounded genal angles, and widely differs in other respects. No North American Phillipsiæ known to the writer, have any close relationship with this one.

*Loc. and Hor.*—Supposed to have been obtained near Dungog, N.S.W.

PHILLIPSIA(?) WATERHOUSEI, sp. nov.

(Plate xlviii., figs. 16-18; Plate lii., fig. 7).

Complete form oval.

*Sp. Chars.*—*Cephalon* subsemicircular, greatest length and width approximately 2 mm., and 4 mm., respectively; finely and densely granulated. Glabella subcylindrical, narrow, very convex, anteriorly sloping to the border rather steeply, basal glabellar furrows small; the anterior and mesial pairs are visible on the cover, basal lobes small, neck-furrows wide and deep, lateral extensions similar; neck-ring strong, very convex, its lateral extensions also strong; frontal limb narrow and close to the glabella. Facial sutures, anteriorly, only gently diverging laterally in their course, posteriorly short and oblique. Fixed cheeks small. Free cheeks moderately large and strongly inflated, borders relatively wide and depressed; genal angles produced into spines apparently ex-

tending almost to the distal end of the thorax. Eyes crescentic, relatively large, faceted and depressed. Axial grooves shallow.

*Thorax* apparently has the normal number of somites, eight being plainly recognisable by the aid of a lens, the whole surface finely granulated. Axis strongly and rather acutely arched, as wide anteriorly as one side-lobe; posteriorly diminishing gradually, the fourth ring appears to be much stronger than the others, and resembles in this respect the neck-ring; all the rings are directed anteriorly, and bear a row of very fine granules on the ridges. Side-lobes strongly convex, ridges and valleys of the segments strong and deep respectively, ridges bearing rows of fine granules; segmental extremities faceted. Axial furrows narrow.

*Pygidium* subtriangular, fairly inflated, granular throughout in a way similar to the thorax; axis prominent, diminishing rapidly posteriorly, and terminating at the border with a moderately fine point; the rings appear to be eight in number. Side-lobes convex, made up of six pairs of segments, apparently. Border narrow, steep and continuous.

*Obs.*—In so small a specimen, it is a difficult matter to clearly distinguish its features; but, under a lens, they become discernible. The glabella in shape slightly resembles that of a Griffithides; and had it not been for the presence on it of three pairs of glabellar furrows, I would have placed it in this genus. It is the smallest and most perfect Carboniferous trilobite belonging either to *Phillipsia* or *Griffithides* obtained in Australia. It may represent only an immature individual, but still mature enough to have all its chief parts developed.

In the shape of the glabella and of the pygidium, this species is not unlike *Phillipsia leei* Woodw., and *P. minor* Woodw.

Dedicated to J. Waterhouse, M.A., Government Inspector of Schools.

*Loc. and Hor.*—Probable Paterson or Dungog District, N.S.W. Carboniferous.

PHILLIPSIA ELONGATA, sp. nov.

(Pl. xlvii., figs. 3-5; Pl. xlviii., fig. 14; and Pl. l., figs. 4-7).

*Phillipsia dubia* Eth. fil., Mem. Geol. Surv. N. S. Wales, Pal.

No. 5, Pt. ii., 1892, pp. 126, 127, Pl. xxi., figs. 1-4, and Pl. xxii., figs. 12, 13.

Complete form elongately oval.

*Sp. Chars.*—*Cephalon* sub-semielliptic, smooth, only moderately inflated, greatest length 12 mm., width between the genal angles 18 mm. Glabella long, narrow, sub-bellshaped, convex and prominent, highest between the anterior lateral furrows, and from thence sloping to the front, which is gently rounded; lateral furrows distinct, first pair short, linear and gently curved, middle pair linear with a posterior curve, posterior pair wide, shallow and circumscribing the basal lobes, which are relatively small and suboval. Neck-furrow shallow, its lateral extensions shallow. Neck-ring narrow, with a strong forward inclination, its lateral extensions also narrow. Frontal border fairly wide, especially at the antero-lateral angles. Facial sutures strongly sinuate anteriorly, and posteriorly obliquely crossing the fixed cheeks nearly in a line with the outer edge of the thorax. Axial furrows deep. Fixed cheeks small. Eye-lobes small, crescentic and elevated. Free cheeks relatively large, depressed, border wide, space between the border and furrow beneath the eyes short and steep; and immediately under the eye is a groove. Eyes large, subcrescentic, very distinctly faceted, and wider behind than in front. Genal angles spinate, the spines evidently long. Thorax with the normal number of somites; length two-thirds of the greatest width, sides subparallel, surface smooth or very finely granulate. Axis prominent, rings with a distinct forward inclination centrally, and showing slight indication on the ridges of granulation, spread equal to one side-lobe; axial furrows faint; side-lobes sloping gently from the axial furrows to the fulera, thence sloping fairly steeply. Mesial furrows of the somites distinct, and reaching to the extremities, the anterior somites shorter than the posterior ones.

*Pygidium* sub-semielliptic, convex, greatest width nearly equal to the greatest width of the thorax, and consequently just on one-third greater than the thoracic length. Axis very prominent, tapering gradually, and ending just within the border at half the anterior width, rather prominently and rounded; annula-

tions twenty, strongly arched; axial furrows distinct; side-lobes strongly convex, their greatest width equals the anterior spread of the axis; segments fourteen, all terminating at the inner boundary of the narrow border.

*Obs.*—This very fine trilobite was described by Mr. R. Etheridge,\* and was determined by him to be identical with his *P. dubia*,† remarking, however, that the form now dealt with differed from the Queensland one in the possession of eighteen to twenty annulations in the pygidial axis, while the former had only eight to ten. This of itself appears to the writer a sufficient difference to justify the separation of the two forms specifically, for, in no instance, has he found any *Phillipsia*, or indeed any member of the *Proëtidae*, presenting such a wide variation in the axial annulations of its pygidium as is exhibited by these two forms. But there are other differences between the two forms of even greater specific importance than this one. The eyes and front limb of the glabella of *P. elongata* are relatively very much larger than those of *P. stanvelliensis* (*P. dubia* Eth. fil.). In the former, the facial sutures are more sinuate, the free cheeks more depressed, eyes more squat on the cheeks, lateral furrows of the free cheeks wider than they are in the latter. The neck-ring and thoracic axial rings in the former are non-tuberculate basally; in the latter, these are tuberculate; the glabella of the former, too, is relatively longer and straighter-sided than is the case in the latter. The former has a relatively narrower pygidial border, and is of a much larger growth than the other.

The two forms, in many of their features, belong to the same typical group of *Phillipsiæ*, in which the glabellæ diminish in width anteriorly, and are sub-bellshaped, and the facial sutures strongly sinuate in front of the eyes. The British *P. truncatula* is a good representative of the group.

*Loc. and Hor.*—Binge Berry, Rouchel Brook, Hunter River, County Durham: (?) Allyn River, half a mile north-east of Gresford; County Durham (Cullen).

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\* Mem. Geol. Survey N. S. Wales, Pal. No. 5, Pt. ii., 1892, pp. 126-8.

† Geol. and Pal. Queensland and New Guinea, p. 215, Pl. 8, fig. 5.

*PHILLIPSIA ROCKHAMPTONENSIS*, sp. nov.

(Plate xlix., figs. 9, 10; Plate l., figs. 8, 9).

*Phillipsia dubia* Etheridge, fil., Geol. and Pal. Queensland and New Guinea, 1892, pp. 214-215, Pl. 44, fig. 4.*P. woodwardi* Eth. fil., *op. cit.*, p. 215, Pl. 44, fig. 6.

Complete form oblong-ovate.

*Sp. Chars.*—*Cephalon* sub-semicircular, appearing to have been very finely granulated. Glabella subcylindrical or conical, widest across the basal lobes, two lateral furrows visible on the left side, basal pair wide, deep, and very distinctly joining the neck-furrow, basal lobes small, very prominent and sub-pyriform; neck-furrow deep centrally and shallowed laterally by a very mild swelling behind the basal glabellar lobes, which can barely be said to be supplementary lobes, its lateral extensions shallow; neck-ring stronger and more convex than any of the axial rings, very faintly tuberculate at its base, front limb narrow, the margin being upturned and gently thickened; axial grooves narrow; fixed cheeks small; eye-lobe relatively large and granulated; free cheeks fairly large, only moderately tumid, depressed but posteriorly high and sloping steeply into the posterior furrow, distinctly channelled under the eyes, lateral furrows wide, lateral borders of moderate width, mildly tumid, under-surface striated; facial sutures not distinguishable anteriorly, and posteriorly obliquely crossing the fixed cheeks rather close to the axial grooves; eyes of medium size, reniform, faceted, prominent and vertically narrow, genal angles bearing long spines.

*Thorax* oblong, length equal to the width of the axis and one side-lobe, granulations microscopic, somites of the normal number, axis strongly convex, wider than one side-lobe, diminishing posteriorly very gently and uniformly, anterior width in the specimen under notice being 5 mm., and the posterior width 4 mm.; each individual ring has a decided anterior trend centrally and tuberculate bases, ridges and valleys narrow, and on the former the articulating seams are plainly visible; side-lobes convex, steeply deflected from the fulcra, segmental ends strongly faceted, axial grooves narrow.

*Pygidium* sub-semicircular or sub-semielliptic, length 7 mm., greatest width 12 mm., convex, distinct indications of granulation present; axis prominent, strongly convex, diminishing rapidly posteriorly, ending prominently near the margin of the border with about one-fourth of its anterior spread, its rings are twelve; axial grooves distinct; side-lobes convex, consisting of eight pairs of segments, the last two pairs being rather indistinct, first pair faceted; border of moderate width, gently tumid, continuous to the anterior pair of segments; undersurface striated.

*Obs.*—This fossil was included by Mr. Etheridge with his species *Phillipsia dubia* (*op cit.*), but not separately described. For so placing it, there appears to me to be insufficient reason. That the trilobite here described is not identical with Mr. Etheridge's *P. dubia* (*P. stanvelliensis* mihi) may be made plain by an explanation of their differences.

(1). The free cheeks and eyes are different, as are their glabellæ; for though the glabella of the present species is not perfect, there is sufficient of it preserved to show that, anteriorly, it neither contracts nor droops as does that of *P. dubia* (*P. stanvelliensis*).

(2). The neck-furrows of the two also differ.

(3). The axis of the former is wider than one side-lobe; in the latter, the axis is narrower than one side-lobe.

(4). The axis of the former is much less prominent than that of the latter.

(5). In the former, the length of the thorax is much greater than its cephalic or pygidial length; in the latter, both the cephalon and pygidium are longer than the thorax.

(6). In the latter, the anterior pleural segments of the pygidium show distinct bifurcation; this is not visible in the former.

(7). The genal angles of the former are strongly spinate; those of the latter are not yet proven to be so.

(8). The middle lobe of the one is wide and moderately convex; that of the other, narrow and very convex.

(9). The angulation of the free cheeks of the former posteriorly, and their steep slope into the furrow are very marked, but this is not so in the latter.



The above differences clearly separate the two species. From all other Australian species, it is easily distinguished.

*Loc. and Hor.*—Rockhampton district, Corner Creek, Great Star River, Queensland. Carboniferous.

PHILLIPSIA STANVELLENSIS, sp.nov.

(Plate xlviii., figs.10-13; Plate li., figs.8-10).

*Phillipsia dubia* Eth. fil., Geol. and Pal. Queensland and New Guinea, 1892, pp.214-215, Pl.8, fig.5.

Complete form elongately ellipsoidal.

*Sp. Chars.*—*Cephalon* sub-semielliptic, strongly inflated, practically smooth, length 6 mm., width between the genal angles 9 mm. Glabella bell-shaped or subconical, high posteriorly, with a steep anterior droop to the front limb, microscopically granulated, three pairs of lateral furrows, basal pair shallow, the others faint; basal lobes very prominent, relatively small and round, mesial pair subquadrate and about equal in size to the basal pair, front pair well-defined. Neck-furrow shallow centrally, but rather deeper behind the basal glabellar lobes, its lateral extensions across the fixed cheeks shallow; neck-ring narrow, strongly arched, and its bases tuberculated, lateral extensions weak; front limb narrow, gently thickened, and turned almost on to the front of the glabella; facial sutures anteriorly only moderately sinuate, posteriorly oblique and crossing the fixed cheeks in a line with the fulcrum of the thoracic segments. Free cheeks relatively large and steep, border moderately wide and strong, lateral furrows linear and faint. Eyes of moderate size, densely and finely faceted, subcrescentic, and rising steeply from the shallow grooves of the cheeks just below them. Genal angles acute, but apparently not spinate.

*Thorax*: length two-thirds of width approximately, and anterior and posterior widths equal; number of somites small, smooth. Axis very prominent, rings arched forward both centrally and basally, bases also tuberculate, centrally each ring is rather acute, which gives to the axis when viewed sideways a mildly serrated aspect; ring-furrows rather deep, ridges high and narrow (in decorticated specimens), greatest width 3 mm., and is



wider than the pleuræ if measured horizontally. Axial grooves linear. Side-lobes between the axial grooves and fulcra almost horizontal, thence nearly perpendicular; somites apparently faceted, medial grooves very shallow, ridges feeble.

*Pygidium* semielliptic, length 6 mm., width 7 mm., smooth. Axis very prominent, made up of twelve if not thirteen annulations, but not more than ten usually visible owing to the slenderness of the posterior ones. Posteriorly it contracts gradually, and ends a little short of the border with about half the anterior width; in some specimens, the rings centrally show emargination and other indications of having borne fine tubercles. Axial grooves faint. Side-lobes convex, consisting of eight pairs of segments whose valleys and ridges are inconspicuous, and the ends, as they approach the border, bifurcate, or, more correctly, the sutures widen out and make the segments appear to have free ends; the individual segments have little or no backward curve, and the last two pairs are indicated merely by a very faint ridge and tubercle; border continuous and relatively wide, concentrically and finely striated underneath, only slightly thickened and separated from the segments by a fine suture.

*Obs.*—This beautiful trilobite was originally described by R. Etheridge, Junr., and with it was joined *Griffithides dubius* Etheridge, Senr., for reasons not explained. All the evidence available leads me to conclude that the two are not specifically the same, and to regret that this very typical *Phillipsia* above-described should have been in any way linked with *Griffithides dubius* Eth. Senr. An examination of the figure given of this latter trilobite reveals that the glabella has three continuous lateral furrows, and a shape altogether unlike the former species; and, further, the latter is represented as having thirteen or fourteen axial rings, and an equal number of pleural segments in its pygidium; while the former has only twelve and eight, respectively, in the similar parts of the pygidium. These differences place the two apart.

As may be observed (*antea*, under the description of *P. elongata* mihi), I have had to disagree with Mr. Etheridge in determining that, and the above form to be specifically the same, for which divergence of opinion reasons are given.

*P. stanvelliensis* is so different from all foreign and other Australian species that it is not necessary to detail its relationships with them.

The outstanding features of the species are. 1. The dunce's hat-shaped, prominent, smooth and anteriorly drooping, and narrow glabella. 2. The slightly elevated glabellar basal lobes. 3. The moderate size, and fine but distinct faceting of the eyes. 4. The very prominent axis. 5. The shallowness of the medial furrows, and slenderness of the ridges of the pleural segments. 6. The bifurcation of the pleural segments of the pygidium. 7. Twelve and eight divisions in the axis and pleural segments, respectively, of the pygidium. 8. The equality of the lengths of head and pygidium.

*Loc. and Hor.*—Corner Creek, Great Star River, Queensland. Carboniferous.

PHILLIPSIA GRANDIS Eth. fil.

(Plate xlvii., fig.2; Plate l., figs.1-3).

*Phillipsia grandis* Eth. fil., Geol. and Pal. of Queensland and New Guinea, 1892, pp.215-216.

Etheridge, Junr., Mem. Geol. Survey N. S. Wales, Pal. No.5, Pt. ii., 1892, Pl. xxi., fig.5 (*non* text-fig.5, p.128).

Etheridge, Junr., Geol. Survey of Queensland, Publication No. 260, pp.11, 12, Pl. iii., fig.3.

Complete form unknown.

*Sp. Chars.*—What appears to be a portion of a cephalon of this species is preserved on a rock-fragment from near Mt. Morgan, Queensland, associated with a very nearly perfect pygidium, free cheeks, a small portion of the anterior of the glabella, and the greater part of the hypostome (*in situ*), but so little of the glabella remains that none of its features can be recognised; except that it was sparsely granulated, sloped gradually anteriorly, and was of unusual size. The hypostome was large, striated, and apparently granulated; free cheeks very large, strongly granulated, the granules in many instances joining and producing rugosity; posterior furrows very wide and shallow; lateral border very wide; and the undersurface bearing six or seven concentric striae, posterior border narrow; the genal angles

appear to have been spinate. The length of the cephalic shield was approximately 30 mm.

*Thorax*: greatest width approximately 45mm., length 27 mm., finely granulated. Axis moderately convex, and had a spread of 15 mm., and hence equal to one side-lobe. These lobes were fairly convex, greatest width 15 mm., and the mesial furrows of each pair of the segments were wide and shallow; along the articulating faces (ridges), the sutures are plainly visible in decorticated specimens.

*Pygidium*: greatest width 41 mm., length 34 mm.; semi-elliptic, moderately convex; axis mildly convex, tapering very gradually posteriorly, ending bluntly at the inner edge of the border, much narrower than one side-lobe, practically two-thirds as wide as one side-lobe, the width being 11 : 15, rings apparently eighteen, strong, densely and finely granulated, valleys narrow; axial furrows narrow and distinct; pleuræ moderately convex; ribs, fifteen pairs, reaching to the thickened outer margin of the border, and having a decided backward curve in the portions traversing the border; mesial valleys fairly deep, ridges strong, and bearing two or more rows of closely placed granules, and articulating sutures plainly visible, each succeeding pair gradually inclining posteriorly, border wide but ill-defined, not continuous and concave, margin thickened and upturned.

*Obs.*—The first fragment of this gigantic Carboniferous trilobite was briefly described by Mr. Etheridge, Junr.,\* and for it he suggested the specific name *grandis*. Subsequently,† he described a pygidium from New South Wales, which he placed specifically with the Queensland pygidial fragment. Very reluctantly, I have to disagree with this latter determination of Mr. Etheridge, and am compelled to give the New South Wales fossil separate specific rank. A recent discovery of a nearly perfect tail, portions of a céphalic shield, and thorax, in the Mt. Morgan area, Queensland, has much simplified the task of separating the two forms. This recently discovered specimen

\* Geol. and Pal. Queensland and New Guinea, 1892, pp.215-216.

† Mem. Geol. Survey N. S. Wales, Pal. No.5, Pt. ii., 1892, p.128, text-fig.5, and Pl. xxi., fig.5.

was submitted by Mr. Dunstan, Chief Government Geologist, Department of Mines, Brisbane, to Mr. Etheridge, who described it briefly,\* placing it with *P. grandis*. This same specimen has been used for the above description. It will be seen that, in the description of the parts of the fossil, we are not in agreement, our dimensional estimates, strangely, differing rather widely.

The dimensions arrived at by myself are :—

Cephalic shield, length 30 mm.

Length of thorax, 20 mm.

Greatest width, 45 mm.

Length of tail, 34 mm.

Greatest width, 44 mm.

Total length of trilobite, 84 mm., or nearly  $3\frac{1}{2}$  inches. A giant, certainly, among Carboniferous trilobites.

The reasons for separating the pygidium from Swain's Selection, near Carroll, N.S.W., from the Queensland forms, are fully entered into under the re-description of the New South Wales form, under the name of *Phillipsia robusta* mihi.

The distinguishing features of the present species are—1. Its great size. 2. The largeness of the free cheeks, their ornamentation, and great width of their borders. 3. The relatively narrow pygidial axis. 4. The mild tuberculation of the bases of the thoracic and pygidial axial rings. 5. The slight tuberculation of the pleural segment at the inner margin of the border, and their claw-like shape, as they cross the border. 6. The plainly visible sutures along the articulating ridges of the pleural segments, and the fine and close granulation of these ridges. 7. The strongly ridged and furrowed somites of the pygidium.

As Mr. Etheridge has pointed out, it is uncertain still whether this trilobite belongs to the genus *Phillipsia* or to *Griffithides*, but the evidence available indicates the former.

*Loc. and Hor.*—Crow's Nest, near Mt. Morgan, Queensland. Carboniferous.

*PHILLIPSIA WOODWARDI* Eth. fil.

*Phillipsia woodwardi* Eth. fil., Geol. and Pal. Queensland and New Guinea, 1892, p.215, Pl. vii., figs.11, 13; Pl. viii., fig.6; and Pl. xliv., figs.5-6.

\* Geol. Survey Queensland, Publication No.260, 1917, pp.11-12, Pl. iii., fig.3.

*Griffithides seminiferus* var. *australasica* Eth. fil., (in part) *op. cit.*, p.216.

(Pl. xlvii., fig.9; Pl. xlix., figs.1-8, 13-14; Pl. l., figs.10-11; Pl. li., figs.12-14; Pl. lii., fig.1; Pl. liii., figs.8-9).

Here is Mr. Etheridge's description of this species (*loc. cit.*):—" *Sp. Char.* Glabella round, without any lateral inflection of the margin, moderately convex in the middle line, and a little arched posteriorly; neck furrow strong and deep, with more or less complete basal furrows; anterior furrows present, but faint; anterior border thick and upwardly turned, leaving a wide depression between it and the front of the glabella."

In his observations, Mr. Etheridge remarks:—"The pygidium referred to is much larger than that described as *P. dubia*, but otherwise resembles it." In the text, there is nothing to show what pygidium is here referred to, for no description of it is given; but no doubt he refers to the pygidium illustrated in Plate xlv., fig.6; and if so, the determination, in my opinion, is incorrect. This pygidium belongs to the trilobite described by me as *Phillipsia rockhamptonensis*, and is shown in Pl. l., fig.8.

The following is a more amplified description of the type-cephalon of the species. Outline subsemicircular, surface granulated. Glabella wider across the basal lobes than it is long, very convex both transversely and longitudinally, the front lobe (the portion anterior to the anterior pair of the lateral furrows) semicircular, highest between the mesial pair of lateral furrows. Three pairs of lateral furrows present, anterior and mesial relatively wide, shallow and straight, basal pair wide and deep; anterior and mesial lobes narrow, basal pair large, subfusiform, much lower than the glabellar centre, overhanging the axial and neck-furrows; limb very large, border strongly thickened and upturned, furrow wide and deep. Neck-furrow deep; neck-ring strong, convex, sharply curving anteriorly, as it approaches the axial furrows; sides gradually thickening towards their origin. Frontal limb very wide, border strongly thickened and upturned, and separated from the glabella by a wide and pronounced furrow, strongly expanded antero-laterally. Facial sutures anteriorly directed outwards at an angle of about 25°. Fixed

cheeks appear to have been small, and strongly tumid. Axial furrows deep. Other parts not known.

As Mr. Etheridge pointed out, this head-shield bears a strong resemblance to that of some *Proëti*. The enormous limb is its most striking feature. The discovery of a complete specimen will be of much scientific interest. It may be noticed here that neither of the figures, Pl. vii., fig. 13, Pl. xlv., figs. 5, 6 (*loc. cit.*) are correct representations of the fossils they are intended to depict. For example, in the case of the first of these, the glabella is much too blunt in front; and supplementary lobes, which are present on the fossil, are not shown in the figure. With reference to figs. 5 and 6 of Pl. xlv., in the case of fig. 5, the glabella is represented as of a battle-axe shape, instead of being rather quadrate, or only gently rounded in front, and the glabellar basal lobes are exaggerated in size. In fig. 6, the axis is shown terminating much too short of the border, and, in the pleural lobes, too many segments are shown. Photographs of the original specimens, from which the drawings of the figures above referred to were made, will be found in the Plates of this paper.

At present, I hesitate to recognise the portion of a cephalon determined by Mr. Etheridge to belong to this species, and represented in Pl. vii., fig. 13, for the following reasons. The glabella of this specimen is much more convex and narrower in front than the type-specimen. Further, this glabella is just as long as wide across the basal glabellar lobes. On the other hand, the typical glabella of the species is much wider across these same lobes than it is long. The glabella in question is not correctly represented by the figure above referred to, as will be seen from the photos of it now produced.

Since Mr. Etheridge described this species, much additional material has been secured, and this has been placed with me by Mr. Dunstan, Chief Government Geologist, Brisbane, for classification. Included in the collection is a large number of pygidia, all possessing similar specific features; and these were collected from the same localities from which all the known cephalic fragments of the species have been obtained. In part, owing to the



association in this way of these heads and tails, and because the great convexity of the pygidia referred to, which would indicate the possession of a very convex cephalon by the species they belong to, and, further, because no other head-shields reasonably preserved occur in association with these remains, with which they appear to have near relationship, I have determined to place them with Mr. Etheridge's *P. woodwardi*, and, for this reason, the species is redescribed hereunder.

Complete form not yet certainly known, but it may be assumed to have been oblong-ovate.

*Cephalon* sub-semicircular, highly inflated, surface granulated throughout. Glabella subquadrate, wide and mildly rounded in front, strongly convex, highest between the mesial lobes, sloping strongly anteriorly, and overhanging the furrow of the limb in front; three pairs of glabellar furrows present, the anterior and mesial pairs rather wide, shallow and straight; basal pair wide and deep; anterior and mesial lobes narrow; basal pair large, subfusiform, much lower than the glabellar superficial centre, overhanging the axial and neck-furrows latero-posteriorly; limb very large, border strongly thickened and upturned, furrow wide and deep; neck-furrow wide and deep; neck-ring strong, convex, bases strongly curving anteriorly under the glabellar basal lobes; supplementary lobes present, though not conspicuous in the most typical specimen. Facial sutures anteriorly directed outwards at an angle of about  $25^{\circ}$ . Fixed cheeks would appear to have been of moderate size, and posteriorly strongly inflated. Free cheeks fairly large, strongly and thickly granulated, especially on the part between the lateral and ocular furrows; this part, too, is high, and rather acutely angulate postero-laterally, flat superficially, laterally and posteriorly steeply falling into the lateral and posterior furrows, which are wide and deep; border much thickened and upturned, striated, posterior border (extension of the neck-ring) strong, genal angles apparently blunt; eyes of moderate size, apparently crescentic and faceted, somewhat sunk into the ocular furrow.

*Thorax*: for certain not known, but the following is the description of one attached to a pygidium identical with a number



of others assumed to belong to this species: suboblong, granulated, longer than the pygidium, all the segmental ridges appear to have borne tubercles; number of segments normal. Axis prominent, ring-bases non-tuberculate, with a strong anterior inclination centrally, ridges and valleys well defined, apparently as wide as one side-lobe. Side-lobes strongly convex and steep between the fulcra and margins, all parts densely granulated, segments anteriorly angulate at the fulcra; mesial furrows wide, ridges relatively narrow and faceted, and mildly thickened posteriorly.

*Pygidium* very strongly convex, length to width approximately 2:3, granulated; axis prominent, evenly arched, anterior spread about equal to the greatest width of one side-lobe, posteriorly diminishing in width very gradually, and ending prominently and bluntly a little short of the border; number of rings thirteen, and each bore a row of small tubercles quite conspicuous on unweathered specimens; axial grooves wide and deep. Side-lobes convex, consisting of eleven pairs of segments, the ridges of each pair bearing rows of small tubercles varying from two or three on the shorter, to eight or perhaps nine on the longer ones. Border continuous, mildly thickened, convex and steep.

*Obs.*—At the outset, I admit that the pygidia here joined with Mr. Etheridge's type-cephalon of the species may yet prove to be a wrong conclusion; but should it happen so, I am inclined to believe, too, that the heads (Pl. li., figs.12, 13) will also prove not identical with the type one; but should that happen, I am fully satisfied that these latter heads, and the tails here dealt with, will prove to belong to the one species. The heads now joined with the typical one possessing the very characteristic frontal limb, cannot, for certain, in the absence of this limb, be said to belong to the species.

While completing the above description, the specimen No.712, belonging to the Queensland Museum, Brisbane, is before me; and the trilobite fossil remains on it consist of two pygidia, one thorax and pygidium conjoined but incomplete, a fragmentary head in intaglio, and a part of a free cheek. (On the same specimen, occurs the tail of a *Brachymetopus*, the first recorded

from Queensland). These fossils were those which chiefly served Mr. Etheridge to found his varietal species *Griffithides seminiferus* var. *australasica* on. After a close study of these remains, I am compelled to dissent from his conclusions concerning them. They cannot belong to the above species, because the glabella possesses supplementary basal lobes, a feature by some palæontologists thought to be of generic significance, and which *G. seminiferus* does not possess. Again, these pygidia have thirteen rings in their axis, and eleven pairs of segments in the pleuræ. In these parts, *G. seminiferus* has twelve and nine respectively. These differences alone would render the specific identity of the two forms invalid, but these are not the only differences between them. As far, then, as the fossils under present consideration afford evidence, Mr. Etheridge's varietal species fails. The part of the cephalon on this same specimen of rock is very imperfect, but it shows, on the glabella, similar but clearer granulation, because the granules are not worn off by weathering, similar glabellar basal and supplementary lobes to that and those respectively found on the cephalons here determined to belong to *Phillipsia woodwardi*. The only features not visible on the glabella of the fragmentary cephalon, to make its identity with the latter certain, are the mesial and anterior glabellar furrows; but these are barely visible on some glabellæ of *P. woodwardi*. Lastly, the pygidium represented in Plate viii., fig. 6 (*op. cit.*), which was considered by Mr. Etheridge to be a normal pygidium of his *P. dubia* (*P. stanwellensis* mihi) is here joined with the present species by me. It is undoubtedly inseparable from the other pygidia now joined with the species above described, and certainly is not at all closely related to the pygidia of *P. stanwellensis* mihi (*P. dubia* Eth. fil., *op. cit.*, Pl. viii., fig. 5).

Mr. Etheridge has already called attention to the Proëtus-like aspect of the cephalon of the present species. The singular form of this part of the fossil makes it unnecessary to point out in detail the features which separate it from other species of *Phillipsia*.

*Loc. and Hor.*—Stoney Creek, Stanwell; Crow's Nest and Trilobite Ridge, Mt. Morgan, Queensland, etc. Associated with

*Brachymetopus dunstani*. Middle or Lower Carboniferous probably.

PHILLIPSIA MORGANENSIS, sp. nov.

(Pl. xlix., figs. 11, 12; Pl. li., fig. 1).

*Sp. Chars.*—*Cephalon* sub-semicircular, very finely granulated, greatest length and width 8 mm., and 16 mm., respectively. Glabella subconical or sub-bellshaped, mildly convex, finely and densely granulated, longer than wide; three pairs of lateral furrows distinctly shown, basal pair very deep and wide, anterior and mesial pairs short and only gently curved posteriorly; anterior and mesial lobes of moderate size, basal pair fairly large, with small complementary lobes present; neck-furrow deep and wide, the extensions laterally also fairly deep and wide; neck-ring strong, moderately convex, strongly curving anteriorly at its bases; facial sutures anteriorly very straight, posteriorly short and oblique, frontal limb narrow and close to the glabellar front; fixed cheeks very small, with small eye-lobes. Free cheeks rather large, only moderately tumid, finely granulated, both borders and lateral furrows large, the former being moderately thickened, finely granulated on the upper and striated on the undersurface, the latter being shallow, ocular furrow wide and shallow. Eyes of moderate size, finely faceted, vertically narrow, and decidedly higher behind than in front. Genal angles obtuse. Hypostome shield-like, narrow, not alate, posteriorly glossiform and corrugated, no striae visible, widest at two-thirds of its length from the front edge.

*Thorax* not known in a complete state, but one, on which a pygidium and a free cheek rest, shows the following features—moderately convex, finely granulated. Axis moderately convex, diminishing in width and height gradually posteriorly, wider than one side-lobe, rings strong, valleys narrow and having an anterior inclination, bases non-tuberculate, axial furrows linear. Side-lobes not well shown, but the segmental ridges and furrows were strong and deep respectively.

*Pygidium* widely triangular, mildly convex and granular, length 7 mm., and greatest width 12 mm. Axis mildly and evenly convex, anterior width equal to that of one side-lobe,

diminishing gradually in width and height posteriorly, and ending short of the margin inconspicuously with about half its anterior width, rings apparently eleven; ridges not prominent. furrows also faint, some of the anterior ones have centrally a backward trend. Axial furrows linear. Side-lobes convex, consisting apparently of nine pairs of segments (eight only are visible on the best available specimen), front pair faceted, ridges and furrows fairly distinct, and having successively only a moderate backward trend.

*Obs.*—This trilobite belongs to the type of *Phillipsia* which had the glabella narrower in front than posteriorly, which seems a common characteristic among the Australian members of the genus, and, in this respect, shows a closer relationship to the typical genus of the Proëtidae, than do the Phillipsiæ of Europe, and, perhaps also, America. A singular feature in the present species is the form of the hypostome assumed to belong to it. None similar to it has come under my notice. The one nearest to it is one figured by Dr. H. Woodward\* with other illustrations of *Phillipsia eichwaldi*, but evidently not belonging to that species. The straightness of the anterior branches of the facial sutures, and their mild outward divergence as they reach the frontal limb, are striking features of the species. A study of the description and illustrations of the species will render its separation from other Australian Phillipsiæ simple. In contour, the glabella is not unlike what that of the glabella placed with *P. woodwardi* (Pl. xlix., fig.7) would be, were it not so convex; but, in the former, the glabella is longer than it is wide across the basal glabellar lobes; in the latter, these dimensions are equal. No foreign species has come under my notice with which it seems necessary to compare it.

*Loc. and Hor.*—Trilobite Ridge, Mount Morgan, Queensland. Carboniferous (Lower?).

PHILLIPSIA CONNOLLI, sp.nov.

(Pl. li., figs.4-7).

*Phillipsia grandis* Eth. fil. (MS.).

Only an incomplete pygidium known.

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\* Mon. Brit. Carb. Trilobites, 1883-4, Pl. iv., fig.7.

*Sp. Chars.*—*Pygidium* semielliptic, moderately convex, and microscopically granulated. Axis very prominent, consisting of ten, possibly eleven rings, not as wide as one side-lobe, evenly arched, and slightly flattened dorsally, ending at the border very prominently and rather acutely, ridges and valleys of the rings quite distinct. Axial grooves shallow. Side-lobes mildly convex, consisting of eight or nine pairs of segments, which are only very gently directed backward, and terminating at the border, except in the case of the anterior pair, which encroaches on it. Mesial furrows and the ridges of the segments moderately defined. Border proportionately wide and continuous, mildly convex, horizontal, and apparently wider laterally than behind, separated from the ribs by a shallow furrow. Greatest width 13 mm., length 9 mm., anterior width of axis 3 mm.

*Obs.*—This pygidium was placed by Mr. Etheridge, Junr., with his *Phillipsia grandis*, but to this species I find it has no close relationship. In its wide border, and the number of axial rings and pleural segments, it bears strong resemblances to our *Griffithides convexicaudatus*, but its axis is much more prominent and relatively narrower, than is that of the latter. The axial and pleural divisions are more clearly defined in the former than they are in the latter; the border in the former is flat, and in the latter very steep. The shape or outline of the pygidia of these species is very different. In number of axial and pleural divisions, this species is related to both *P. coulteri* and *P. stanvellsensis*, but not otherwise. In possessing very prominent and relatively narrow axes, *P. stanvellsensis* and the present species agree. I am not aware of any foreign Carboniferous trilobite having a pygidium closely resembling this one.

Named after Mr. Connolly, who discovered it.

*Loc. and Hor.*—Gascoigne River, West Australia (Connolly). Carboniferous.

#### PHILLIPSIA ROUCHELENSIS, sp. nov.

*Phillipsia* sp., ind. (*a*), Eth. fil., Mem. Geol. Surv. N. S. Wales, Pal. No. 5, Pt. ii., 1892, p. 129, Pl. xxi., figs. 6, 7.

(Pl. xlviii., figs. 4, 5, 6, 7).

Cephalon and thorax unknown.

*Sp. Chars.*—*Pygidium* sub-semicircular, width 15 mm., length 11 mm.; smooth and moderately inflated. Axis moderately convex, tapering very gradually, and terminating bluntly with a spread rather greater than half that of the first ring; anterior width about equal to that of one side-lobe; consisting of eighteen rings, some of which show traces of having been very mildly tuberculated; axial furrows faint. Side-lobes convex, with no decided fulcra, segments thirteen, or doubtfully fourteen, mildly recurved, not crossing the border; border of moderate width, steep, smooth, and separated from the pleural segments by a fine suture.

*Obs.*—This pygidium was briefly described by Mr. Etheridge (*loc. cit.*), but not specifically named, though he stated that it possessed certain features which clearly indicated that it was a new species. It differs from all other species of *Phillipsia* and *Griffithides* known to me.

*Loc. and Hor.*—Binge Berry, Rouchel Brook, near Muswellbrook; County Durham.

PHILLIPSIA DUNGOGENSIS, sp.nov.

*Phillipsia* sp. ind. (*b*), Eth. fil., Mem. Geol. Surv. N. S. Wales, Pal. No.5, Pt. ii., 1892, p.129; Pl. xxii., fig.14.

(Plate xlvii., figs.6, 7).

Complete form unknown.

*Sp. Chars.*—*Pygidium* sub-semicircular, very moderately convex, finely granulated throughout, greatest width 22 mm., length 16 mm. Axis mildly convex, consisting of fourteen annulations, the furrows and ridges of which are respectively shallow and low, diminishing very slightly in width posteriorly, the end being wide and rounded, bases of the rings not tuberculate, anterior width less than one side-lobe; axial furrows fairly distinct. Pleurae gently inflated and sloping from the axial furrows; segments twelve pairs, which are very completely fused, the four anterior pairs reaching to the outer margin, medial furrows wide and shallow, ridges not prominent and showing no sutures; border narrow and continuous.



*Obs.*—This is another of the pygidia described by Mr. Etheridge, Junr., (*loc. cit.*) but which he did not specifically name. It resembles no other Australian Carboniferous form at all closely; and, so far as I have been able to ascertain, it stands apart from the pygidia of foreign species of the genera *Phillipsia* and *Griffithides*.

*Loc. and Hor.*—Greenhills, near Dungog; County Durham. Carboniferous.

#### Genus GRIFFITHIDES Portlock, 1843.

Geol. Report, Londonderry, &c., p.310.

The following is Portlock's original description of the genus—*"Cephalothorax* semi-oval, longitudinal: glabella strongly marked and gibbous, rounded in front, narrowed posteriorly into an obsolete neck with a furrow more or less distinct on each side. *Cheeks*: triangular spaces very slightly convex. *Wings* either ending in an angle posteriorly or prolonged backwards in a flattened spine. *Eyes* near the axis, not large, lunate, smooth(?). The minute neck tubercle sometimes present."

*"Thorax.*—The pleuripedes are compound, in number nine, or with the neck segment ten."

*"Pygidium.*—Fully developed and strongly resembling that of *Phillipsia*."

General A. W. Vogdes (*loc. cit.*) gives the following brief summary of the generic features of this genus:—1. Glabella short, tumid. 2. No short lateral furrows on the glabella. 3. Basal lobes distinct. 4. Eyes small, placed close on the glabella, reniform. 5. Axis of pygidium has 10 to 17 segments.

#### GRIFFITHIDES CONVEXICAUDATUS, sp.nov.

(Pl. xlv., fig.13; Pl. xlviii., figs.1-3; Pl. lii., figs.5, 6).

*Sp. Chars.*—Complete form suboval with straight sides *Cephalon* sub-semicircular, apparently finely granulated and strongly inflated. Glabella subpyriform, tumid; basal furrows faint; basal lobes relatively small; neck-furrow shallow, its lateral extensions deeper, and communicating with the lateral furrows of the free cheeks; neck-ring wider than the axial rings of the

thorax, its lateral extensions narrow but prominent. Axial grooves faint. Fixed cheeks very small and high; palpebral lobe high, narrow, convex, and very faintly separated from the basal lobe. Free cheeks high, sharply rising from the narrow lateral furrows, lateral border narrow, thickened and raised. Eyes reniform, short fore and aft, high and prominent, separated from the upper and flattened part of the cheeks by a faint sulcus, apparently faceted. Facial sutures anteriorly follow the course of the axial grooves, posteriorly oblique passing out in a line with the fulcræ of the thoracic pleuræ. Limb narrow and pressed to the front of the glabella. Genal angles bear very short spines.

*Thorax* fairly convex, finely granulated, rectangular, length practically two-thirds of greatest width, anterior and posterior widths approximately equal, somites nine. Axis prominent, widely and evenly arched transversely, width or spread throughout about equal, the last two rings only being slightly contracted, a little wider than one side-lobe, centrally the rings have a gentle forward arch, and bear a row of inconspicuous granules, bases non-tuberculate; axial furrows shallow. Side-lobes sloping very gently from the axial furrows to the fulcræ and thence fairly steeply, median furrows of each segment narrow and shallow, but reaching just to the margin, ends faceted.

*Pygidium* sub-semicircular, evenly and very convex, finely granulate, length equal to length of thorax, and to about three-fourths of its own greatest width (9:13); axis convex, bearing eleven annulations, diminishing posteriorly very gradually in width and prominence, ending bluntly and rounded a little short of the border. Its length equals seven-ninths of the pygidial length, annulations faint, especially towards the distal end. Side-lobes strongly convex, anteriorly having a spread approximately equal to that of the axis, possessing eight ribs, only the first three pairs being at all conspicuous; all, except the first pair, stop at the faint furrow separating them from the wide, convex, smooth border.

*Obs.*—The individual, which served for the above description, measured 25 mm., of which the cephalon was 7 mm., the thorax and pygidium 9 mm. each; width of thorax 14 mm. The speci-

men was not quite complete, being minus part of the right front quarter of the cephalon.

This fossil agrees very closely with one described by De Koninck from the Upper William River,\* and determined by him to be *Griffithides (Phillipsia) eichwaldi*. The total lengths of the two fossils exactly agree, as also do the widths of the thoraces; but there are some discrepancies in the dimensions of the separate parts. De Koninck gives 10 mm. and 8 mm., respectively, for thorax and pygidium of his specimen; whilst 9 mm. is the length of each of these parts in the specimen under review. The two have nearly the same number of annulations in the pygidial axis, and probably the same number of pleural ribs, a similar wide pygidial border; also the same relative length to width of their pygidia, and an identical frontal projection of the glabella on to the border. In the characters of granulation and of thoraces and pleural ribs of the pygidia, they also agree. If, at this, the discussion of their relationship stopped, the identity of the two would have to be accepted as conclusive, as I believe it actually to be. But against these agreements have to be placed some important differences, which make their specific identity difficult to reconcile. For instance, De Koninck states that his specimen has only eight thoracic segments, that the anterior annulation of the thoracic axis has a width† of 3 mm., and not one of the annulations has a width less than 1 mm. The present specimen has the normal nine somites, and the widest annulation of the thoracic axis does not exceed 1 mm. De Koninck's figure of his specimen shows it to have had a very globular frontal glabellar lobe, and, in this, differs from the one above described. Again, De Koninck's text does not agree with his illustration. The former indicates his specimen to have eight thoracic somites, and the pleural lobes to have a width equal to that of the thoracic axis; but his figure shows nine somites, and pleural lobes much narrower than the axis. These important discrepancies make it impossible to accept his

\* Foss. Pal. Nouv. Galles du Sud, Pt. i., 1876, pp.278-9, Pl. xxiv., fig.8.

† The writer assumes the width of the axial rings to be their measurement along the longitudinal line of the axis.

description as having any scientific value, for there is no evidence to show whether his text or figure is correct, the type-specimen having been destroyed in the Garden Palace fire of 1882.

The next consideration is whether the present fossil, or even De Koninck's, is specifically identical with *P. eichwaldi* Fischer. Accepting the types given by Dr. H. Woodward\* as fully reliable, the author does not believe it a difficult task to prove the negative.

1. Dimensions.—The relative lengths to widths of the parts of the author's fossil and that of *P. eichwaldi* Fischer, are, respectively, for cephalon 14 : 28 and 17 : 27; thorax 17 : 28 and 17 : 31; pygidium 9 : 13 and 1 : 1.

The dimensional differences, as these measurements show, place the fossils apart; but these are not nearly so important specifically as the following. The pygidium of *P. eichwaldi* is semi-elliptical, and the length equal to the width: that of the author's is sub-semicircular; that is, if the centre of the junction of the second axial ring with the third be taken for centre, the portion of the pygidium posterior to this forms a semicircle; and the length is only two-thirds of the width, approximately. There are up to sixteen rings in the axis, and twelve to fourteen pleural divisions in the pygidium of *P. eichwaldi*; while, in the local one, these divisions are eleven and eight, respectively. Then, in the former, the pygidial border is depressed; in the latter, the curve of convexity of the pleuræ continues uninterruptedly across the border to the outer edge. In the former, also, the genal spines are long; in the latter, *very* short, only extending past the first thoracic segment. These differences are sufficient to prove that the author's specimen is not *P. eichwaldi* Fischer, and the same conclusion may be drawn in respect to De Koninck's fossil.

In several respects, this species resembles *Griffithides globiceps* Phillips; but the proportionate lengths of the thorax and pygidium of the latter are different from those of the former; as also is the proportionate length of the cephalon to these same parts. In the former, there is no lobe connecting the eye-lobe with the

\* Mon. British Trilobites, Pt. i., 1883.

glabella, though, indeed, the eye or palpebral lobe is very close to, and only faintly separated from, the basal lobe of the glabella. The eye, too, is relatively larger, the pygidial border is wider, and the glabellar frontal lobe less globular; the free cheek border and glabellar limb narrower, and the eyes less prominent and more posteriorly situated in the former than in the latter. The British species, too, was much larger than the New South Wales one.

The specific name was chosen for it because of the strong convexity of its pygidium.

*Loc. and Hor.*—Glen William, about two miles from Clarendon town, Parish Parr, County Durham. Lower Carboniferous.

GRIFFITHIDES SWEETI Eth. fil.

*Griffithides sweeti* Eth. fil., Proc. Linn. Soc. N. S. Wales, (2), Vol. ix., Pt. 3, pp. 528-9, Pl. xxxix., fig. 3, 1894.

(Pl. liii, figs. 1, 2).

Through the courtesy of Mr. G. Sweet, of Melbourne, the type-specimen of the species is before me, and I regret that, owing to the incompleteness of its cephalon, it fails to elucidate certain difficulties met with in considering the thoraces and pygidia from the Mt. Morgan area, assumed to belong to *Phillipsia woodwardi* Eth. fil., or to settle whether *G. sweeti* Eth. fil., and that species are not identical. All the numerous pygidia obtained from the Mt. Morgan area, except those which belong to *P. stanwellsensis*, *P. rockhamptonensis*, and *P. morganensis*, have thirteen axial, and eleven pleural divisions; and, after most careful and repeated inspection, I have to conclude that Mr. Etheridge's *G. sweeti* has the same number of divisions in the axis and pleuræ of its pygidium; also the same kind of pygidial border and furrow; and, in fact, its pygidium cannot be separated from pygidia which are the most plentiful in the Mt. Morgan district, and which I have tentatively considered to belong to *P. woodwardi*, or at least to those cephalons represented on Pl. li., figs. 12 and 13, because these, too, were the most plentiful cephalons occurring in the same area. As regards the head-shield of *G. sweeti*, sufficient of it has not been conserved

to enable one to say positively whether its features place it with the *Phillipsia* or the *Griffithides* type; but, except for the uncertainty of the presence on its glabella of the normal lateral furrows of the *Phillipsian* genus, it does not differ from the head-shields above referred to, which are considered to belong to *P. woodwardi* Eth. fil. Further, it will be found that *G. sweeti*, as far as present evidence admits, cannot be separated from *Griffithides seminiferus* var. *australasica* Eth. fil. This, I think, will be conceded after the description and figures of the latter have been studied in conjunction with my remarks on the latter, under *P. woodwardi*; and an examination of Plate li., fig. 14, which is a photo of Mr. Etheridge's type-specimen, which shows two tails, the greater portion of a thorax and tail conjoined, an intaglio of a portion of a head, and, between the two tails and on the left top corner, is a view in relief of this intaglio.

We are up against a problem here, which can be solved only by the discovery of better material; and when it is solved, it seems to me that a new genus or subgenus will be needed for the reception of this trilobite with the ten thoracic somites.

The following is a fuller description of the species than is given by Mr. Etheridge. It will be seen from the photographs of this species now given, that it was not as correctly figured as it might have been.

Complete form suboval.

*Sp. Chars.* — *Cephalon* incomplete, apparently granulated throughout, with granules of uniform size. Glabella incomplete, moderately tumid, mesial and anterior furrows not visible (though there appears to be a faint trace of the mesial pair); basal furrows deep, joining the neck-furrow; basal lobes fairly large, suboval; supplementary lobes of moderate size, and suboval; neck-furrow wide and fairly deep; neck-ring stronger than any of the axial rings of the thorax. Fixed and free cheeks absent.

*Thorax* consisting of ten segments, finely and evenly granulated; axis prominent, diminishing posteriorly very little in prominence, and barely at all in spread; each ring, except the last, has centrally a slightly forward direction, the last ring is stronger than the others, non-tuberculate; axial furrows shallow.



Side-lobes, between the axial furrows and fulcra, rising very gently, and thence are depressed almost at right angles, segmental ends strongly faceted, and the ridges and valleys strong and deep respectively, segments strongly angulate at the fulcra, the whole thoracic surface was finely granulated.

*Pygidium* subelliptic, finely granulated, strongly convex: axis prominent, rings thirteen, the anterior one being somewhat overlapped by the last thoracic one, decreasing in spread gradually and ending prominently at about half of its anterior spread, a little short of the border; axial furrows distinct, side-lobes strongly convex, granulated, consisting of eleven segments, each very gently and increasingly curving posteriorly, segmental ridges strong, valleys deep; border entire, steep, very finely granulated, middle thickened and relatively wide, separated from the pleural segments by a narrow furrow, accentuated by punctations at each segmental end.

GRIFFITHIDES DUBIUS Etheridge Senr.

*Griffithides dubius* Etheridge Senr., Quart. Journ. Geol. Soc., 1872, Vol. xxviii., p.338, Pl. xviii., fig.7.

*Phillipsia dubia* Eth. fil., Geol. Pal. Queensland and New Guinea, 1892, pp.214, 215, Pl. 7, fig.12.

(Pl. liii., fig.7).

The original description is as follows:—"Body elongated, oval, length about twice the width, sides parallel. Axis width of pleuræ. Thoracic segments 10 to 12. Pygidium rounded, margins entire; axis composed of ten segments, not extending quite to the posterior margin. Cephalic portion much crushed; glabella small and round anteriorly, furrows indistinct. Owing to the crustaceous test being removed, we have no means of arriving at the condition of the original ornamentation; there are, however, indications of tubercles upon the axis of the pygidium."

"Loc. Don River, Queensland. Form. Carboniferous."

The whereabouts of the type-specimen I have not been able to discover, and, consequently, cannot add anything to the above description.

In the possession of ten or more segments in the thorax, it resembles *G. sweeti* Eth. fil., and, certainly, in this respect, is not a normal *Griffithides* or *Phillipsia*. This peculiarity, too, very decidedly separates it from *P. stanwellensis* mihi (*P. dubia* Eth. fil.).

### Family PROETIDÆ.

Genus BRACHYMETOPUS McCoy, 1847.

Ann. Mag. Nat. Hist., xx., p 229, Pl. xii., figs. 1a, 1b.

McCoy's description of the genus is as follows:—"Gen. Char. Cephalothorax truncato-orbicular; limb narrow, produced backwards into flattened spines; glabella smooth, cylindrical or ovate, about twice as long as wide, not reaching within about its own diameter of the front margin; one pair of small, basal, cephalothoracic lobes, or none. Eyes reniform, in the midst of the cheeks (?smooth); eye-lines unknown. Surface strongly granulated; one tubercle on each side of the anterior end of the glabella, the marginal row and a circle round each eye being larger than the rest. Body-segments unknown. Pygidium nearly resembling the cephalothorax in size and form, rather more pointed, strongly trilobed, and with a thickened prominent margin; axial lobe about as wide as the lateral lobes, of about seventeen narrow segments; lateral segments about seven, divided from their origin, each terminating in a large tubercle at the margin." Genotype, *Br. strzeleckii*.

In this description, characters are included which are merely specific. H. Woodward\* supplies the following amended description of the genus:—"General form elliptical; headshield semicircular and slightly pointed, about one-third wider than long; glabella small, somewhat elevated, one-third the width of the entire shield and about one-half the length, having a basal lobe on each side, but no short lateral furrows on the glabella; neck-furrow distinctly marked, equal in width to the posterior border of the free cheeks; eyes small, smooth, equal to half the length of the glabella; no facial sutures visible, only the axial furrow surrounding the glabella and the neck-furrow; free cheeks slightly

\* Mon. Brit. Carb. Trilobites, 1883-4, pp. 46-7.

convex, nearly twice as long as they are broad, with no visible suture separating them from one another in front of the glabella: margin broad and slightly grooved, angles of cheeks produced posteriorly into spines. The entire surface of the head covered irregularly with a small bead-like ornamentation."

"Thoracic segments unknown, probably nine."

"Pygidium consisting of a variable number of segments, from ten to seventeen, according to species, the axis tapering rapidly to a bluntly rounded extremity, each segment of axis ornamented with bead-like granulations, ribs with a double furrow extending nearly to the border which is smooth and rounded."

This description also includes quite a number of features that possess only specific significance.

General A. W. Vogdes\* summarises the characters of the genus thus:—1. Glabella short, tumid. 2. No short lateral furrows on the glabella. 3. Basal lobes distinct. 4. Eyes small, placed close to the glabella. 5. Axis of the pygidium has ten to seventeen segments.

To this may be added—6. Facial sutures absent. 7. Axial furrows continue round the glabella-front. 8. Ornamentation bead-like.

R. F. Cowper Reed† has suggested a genus or subgenus (*Brachymetopina*) for the European forms without defined cephalic margins, and non-spinate pygidial margins.

#### BRACHYMETOPUS STRZELECKII McCoy, 1847.

*Brachymetopus strzeleckii* McCoy, 1847, *op. cit.*, p.231, Pl. xii., fig.1. De Koninck, Foss. Pal. Nouv. Galles du Sud, 1877, p.352, Pl. xxiv., figs.10, 10*a*, *b*, *c*. Vogdes, Trans. Acad. Sc. St. Louis, Vol. v. (1892), p.617. Etheridge, R., Junr., Mem. Geol. Surv. N. S. Wales, 1892, Pal. No.5, Pt. ii., p.124. Reed, Geol. Mag., N.S., Dec. iv., Vol. x., 1903, pp.193-196.

(Plate liii., figs.3-6).

McCoy's brief description is as follows:—"Sp. Char. Glabella

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\* "North American Carboniferous Trilobites." Ann. New York Acad. Sci., vi., 1888, p.70.

† Geol. Mag., N.S., Dec. iv., Vol. x., p.196.

widest at the base, with one very minute obscurely marked cephalothoracic furrow at the base on each side; all the segments of the pygidium with an irregularly tuberculated ridge along the middle; lateral segments forming large tubercles where they join the thickened limb, opposite each of which there is a short slender spine projecting from the margin."

The following is a fuller description of the species by F. R. C. Reed (*op. cit.*):—"Head-shield semicircular, moderately convex, with strong raised rounded border increasing slightly in width towards the front, and separated off by a deep furrow. Genal angles furnished with slender divergent smooth spines, less than half the length of the head-shield. At its base is a pair of small nodular basal lobes, in most specimens quite inconspicuous. Two large tubercles are situated in a line down the middle of the glabella, followed by a similar median one on the occipital segment. Occipital segment strong, rounded, separated off by a deep furrow. On cheeks at anterior end of glabella is a pair of large tubercles one on each side. No facial sutures visible. Eyes prominent, reniform, less than half the length of the glabella, distant from the axial furrows about one-third the width of the cheeks, and about their own length from posterior margin. Surface of head-shield, including glabella, border and neck-segment, rather coarsely tuberculated. An indistinct ring of larger tubercles surrounds the eyes, and a large tubercle is situated at each end of eyes on inner side. Thorax unknown. Pygidium semicircular, slightly convex, with spinose margin. Axis broad, conical, about one-third the width of the pygidium at front end, tapers rather rapidly to obtuse point, nearly touching the border: consists of 9-10 segments, of which eight rings are distinct and completely tuberculated across: the 1st, 3rd, 5th, and 7th have, in addition, a large median tubercle. Lateral lobes consist of six (?seven in some) pairs of pleuræ, of which the last pair is very small: each pleura is gently curved and is divided unequally by a strong longitudinal furrow into a broader, raised, rounded, posterior ridge, and a narrower anterior ridge. The posterior ridge of each pleura crosses a distinct, raised, rounded border, which surrounds the pygidium and bears a large

tubercle at the spot where it crosses, and a single median one behind the axis. The posterior pleural ridges are prolonged into short, recurved, equidistant, and subequal spines, projecting beyond the margin. (In one specimen there seems to be a median spine behind the axis. In another immature example the anterior two or three pairs of spines are half as long as the whole pygidium). Surface of pygidium rather coarsely tuberculated; the posterior ridge of each pleura bears 4-5 tubercles, and the anterior ridge 5-6 smaller ones. The axial rings bear each 5-7 tubercles."

"Dimensions:—

Length of head-shield	...	...	...	..	3.0 mm.
Width of head-shield	...	...	...	...	4.5 mm.
Length of pygidium	...	...	...	...	2.5 mm.
Width of pygidium	...	...	...	...	4.0 mm.

For affinities, see *op. cit.*

To quote Reed further, he remarks that "McCoy gave as generic characters the circle of tubercles round the eyes and pair of large tubercles at the front end of the glabella, but these may well be considered as of lower classificatory value, and likewise the relatively greater length of the glabella as compared with the European species. It does not, however, seem possible to regard the peculiar pygidial characters in the same light, though, as Vogdes (Trans. Acad. Sc. St. Louis, Vol. v. (1892), p. 617) says, we have many other genera of trilobites with spinose and non-spinose representatives. The fewer number of segments in the pygidium, and the raised spinigerous border separate it from all the European forms."

"The genus or subgenus *Phaetonides*, as now understood, is partly distinguished for analogous reasons from the typical *Proëtus*; and it seems open to question whether the European species of *Brachymetopus* should not be regarded as constituting a distinct group or subgenus for which the name of *Brachymetopina* may be suggested."

Personally, I do not think that pygidial characteristics alone are sufficient grounds upon which to found even a subgenus

*Loc. and Hor.*—Dunvegan, Burrageood, and Glen William,

N.S.W. (Etheridge, Junr., Cat. Austr. Foss., Camb., 1878, p.41). Carboniferous.

BRACHYMETOPUS DUNSTANI, sp.nov.

(Pl. xlix., figs.15, 16; Pl. lii., figs.1, 2).

Complete form unknown.

*Sp. Chars.*—*Cephalon*: length and width 3 mm., and 4 mm., respectively; semielliptic, surface covered with tubercles of varying size, only mildly convex; glabella conical, densely and evenly granulated, very mildly convex, basal furrows well defined and joining the neck-furrow, basal lobes small, greatest width about one-fourth that of the cephalon, length about half that of the cephalon; the surrounding axial furrow relatively deep, cheeks gently convex, bordering the furrow surrounding the glabella; they bear eleven tubercles of uniform size, and follow a course inside of the eyes to the posterior margin; from the front of the eyes there branches from this main bead-like chain of tubercles two other sets (one on each side) of five each, which are arranged along the outer boundary of the eyes; the one or two tubercles in front of, and the one in line with, the back of each eye, appear to be larger than the others of these sets; besides these rows there are a few tubercles bordering the inner edge of the marginal furrow, and the thickened border bears a chain of these small bead-like tubercles of uniform size, and about twenty-five in number, the rest of the surface being finely granulated. The eyes are small, crescentic, close to the glabella and posterior margin; neck-furrow shallow, as are also its lateral extensions; neck-ring fairly robust and granulated, lateral extensions relatively strong and narrow; border-furrow wide and deep; border strongly tumid and tuberculate; angles, if not spinate, are acute.

*Obs.*—The above *Brachymetopus* is the first and only specimen of the genus collected from the Carboniferous rocks of Queensland. It occurs at Trilobite Ridge, Mt. Morgan, Queensland, associated with other genera of trilobites. In several features it resembles *Br. strzeleckii* McCoy, the prototype, and agrees with this species and *Br. Maccayi* in possessing a well-defined cephalic marginal border, bounded inwardly by a well-defined furrow.



The tuberculation, too, on this border is similar in the three species. Dimensionally, this species agrees closely with *Br. strzeleckii*, judging from the dimensions given by Reed,\* so also does it in part in the character of the ornamentation, but in part in this respect, it differs very widely, as the description shows.

The chief differences between our species and *Br. strzeleckii* are—1. The character of the ornamentation. 2. The more conical shape of the glabella in ours, and the absence of the large longitudinally placed tubercles on this part. 3. The more acutely rounded cephalon, particularly at the front. 4. The eyes are situated closer to the posterior border, and perhaps to the glabella. 5. The lateral extensions of the neck-ring are narrow and prominent. Without doubt, the two forms are closely related.

Since writing the above, I have found, on some of the Queensland specimens from Rockhampton and Mt. Morgan districts, several pygidia and a portion (cheek) of a cephalic shield, which belong to the genus *Brachymetopus*. One of these pygidia, which is fairly well preserved, I am assuming to be specifically identical with the cephalon above described. Its description is as follows.

*Pygidium* semicircular, only mildly convex, strongly tuberculate. Axis moderately prominent, contracting gradually posteriorly, ending short of the border bluntly, with less than half its anterior width; it bears five longitudinal rows of tubercles, the individuals of the middle row being much larger than those in the rows on each side of it. There are at least twelve or thirteen rings in the axis, and a central tubercle on ten of these can be clearly seen; this applies also in the case of each row immediately adjacent to the central one. Axial furrows deep. Side-lobes consist of six (? seven) pairs of segments, the ridges of which are very prominent, and bear several relatively large tubercles and some of smaller size; each of the posterior pair merely consists of a tubercle, and each ridge of the anterior pairs bears several tubercles varying much in size, the larger being

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\* Geol. Mag., N.S., Dec. iv., Vol. x., 1903, pp.193-196.

situated near the axial furrows and border; the ribs apparently extend into spines beyond the border, mesial furrows of the ribs deep. Border of moderate width, and apparently only mildly thickened.

This pygidium, though it presents in a general way a strong resemblance to that of *Br. strzeleckii*, exhibits features which help to separate the two forms. The chief differences between their pygidia are—1. The axis of *Br. dunstani* consists of twelve or thirteen rings, as against ten in the other. 2. Five longitudinal rows of tubercles traverse the axis of the former, while seven rows occur on the latter on the same part. 3. A large tubercle is situated centrally on each axial ring of the former, but only on every alternate axial ring in the latter. 4. There is a smaller number of tubercles on each pleural segment of the former than on the similar segments of the latter. The pygidial ornamentation of our species agrees closely with *Br. lodiensis* Meek.

Dedicated to Mr. B. Dunstan, Chief Government Geologist, Brisbane, whose palæontological discoveries have been numerous and important.

*Loc. and Hor.*—Trilobite Ridge, Mt. Morgan, Queensland, associated with *P. woodwardi*. Lower or Middle Carboniferous. Specimens Nos. F 1031, F 1007, Geological Museum, Dept. of Mines, Brisbane; and No. 712, Queensland Museum, Brisbane.

#### BRACHYMETOPUS, sp. indet.

In addition to the head and tail, which served for the description of *Br. dunstani*, there occur on specimen No. 712 of the Queensland Museum, Brisbane, no less than three pygidial fragments of *Brachymetopi*, besides the pygidium which served for the foregoing description of *Br. dunstani*. In the case of two, one is partially superimposed on the other, and the third is almost touching these. On specimen F 1007 is a portion of a right cheek, which presents features evidently unlike either *Br. strzeleckii* or *Br. dunstani*. Two of the fragmentary pygidia also appear to be new, and may be specifically identical with the individual to which the cheek-fragment belonged. The material,

however, is too fragmentary to describe and figure. The occurrence of three pygidia in a bunch indicates that they may be plentiful, and careful search may bring better specimens to light.

# EXPLANATION OF PLATES XLVI.-LIII.

## Plate xlv.

### *Phillipsia collinsi* Mitchell.

Figs. 1, 2, 3, 4, 5.—Fig. 1 is a photo ( $\times 3$ ) made from the specimen represented in Fig. 2. The glabellar features are plainly visible. Figs. 3, 4, 5 represent pygidia, and show their characteristic features very well. Figs. 4 and 5  $\times \frac{1}{4}$  (about). (Coll. Mitchell).

### *Phillipsia coulteri* Mitchell.

Figs. 6, 7, 8, 9, 10.—Different views of one individual. Fig. 6  $\times \frac{1}{4}$ , and Fig. 10 nearly natural size. In Figs. 8 and 9, the mild dorsal serration is visible. In Fig. 10, the hypostome is plainly seen, and the rather large tubercle of the terminal axial ring. (Coll. Mitchell).

### *Phillipsia breviceps* Mitchell.

Figs. 11, 12.—Cephalon and tail. (Coll. Mitchell).

### *Griffithides convexicaudatus* Mitchell.

Fig. 13.—Dorsal view. (Coll. Mitchell).

### *Phillipsia stroudensis* Mitchell.

Fig. 14.—The specific features clearly represented; ( $\times \frac{1}{2}$ ). (Coll. Mitchell).

### *Phillipsia proxima* Mitchell.

Figs. 15, 16.—Two views of a pygidium, the latter about natural size. (Coll. Mitchell).

## Plate xlvii.

### *Phillipsia robusta* Mitchell.

Fig. 1.—The pygidium originally described by Mr. R. Etheridge, Junr., as *P. grandis*. It shows the important features rather clearly. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. 1492).

### *Phillipsia grandis* Eth. fil.

Fig. 2.—Photo of the specimen originally described by Mr. R. Etheridge, Junr., and for which the specific name *grandis* was first suggested by him. The figure shows how different in character are the pleural ribs from those of *P. robusta*; the sutures along the articulating ridges, and the crossing of the border by the anterior ribs. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. 1500).

### *Phillipsia elongata* Mitchell.

Figs. 3, 4.—Casts from an almost perfect mould or cover. They exhibit clearly the features of this fine trilobite. [Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. 1500, (cover)].

Fig.5.—The natural cast. Part of the right side of the cephalon is absent. Shows traces of the left genal spine. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. Fig.3, F1500, etc.).

*Phillipsia dungogensis* Mitchell.

Fig.6.—Part of a pygidium, showing the continuous border, and other essential features. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No.1494).

Fig.7.—A smaller and nearly perfect pygidium; ( $\times \frac{5}{2}$ ). (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No.1494).

*Phillipsia robusta* Mitchell.

Fig.8.—Another view of the pygidium, only less enlarged.

*Phillipsia woodwardi* Eth.fil.

Fig.9.—Medial portion of a cephalon much weathered. (Coll. Geological Museum, Dept. of Mines, Brisbane. No.F.1017).

Plate xlviii.

All figures on this Plate  $\times \frac{3}{2}$  about.

*Griffithides convexicaudatus* Mitchell.

Figs.1, 2.—Dorsal and side-view.

Fig.3.—Pygidium and free cheek, with the eye of a young individual; the free cheek partly covering the tail. (Coll. Mitchell).

*Phillipsia rouchelensis* Mitchell.

Figs. 4, 5, 6, 7.—Four pygidia. They exhibit the specific features. Figs. 5 and 7 are photos of the specimens used by Mr. Etheridge for his figures (Pl. xxi., figs. 6-7, *op. cit.*, *antea*). (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. Nos. E 1495, 3534 (2), F 1595).

*Phillipsia collinsi* Mitchell.

Figs.8, 9.—Fragmentary head-shield, and faint outline of a poorly preserved but almost complete individual. In Fig.8, all the glabellar features are visible. (Coll. Mitchell).

*Phillipsia stanwellensis* Mitchell.

Figs.10, 11, 12.—Three different views of a mature individual. The specimen represented by these figures was used by Mr. Etheridge for his Queensland type of *P. dubia* (Pl. viii., fig.5, *op. cit.*). (Coll. Geological Museum, Dept. of Mines, Brisbane. No.F 969).

Fig.13.—On this photo are the middle part of a cephalon and a pygidium of an immature individual. The former shows the normal and dunce's hat-like shape of the glabella, globular basal glabellar lobes, and the relatively strong neck-ring. The pygidium shows the narrow, prominent axis, etc., characteristic of the species. (Coll. Geological Museum, Dept. of Mines, Brisbane. No.F 980).

*Phillipsia elongata* Mitchell.

Fig. 14.—Portion of a head-shield, thorax, and tail. The markings on the basal glabellar lobes are accidental. The normal glabellar frontal limb and anterior courses of the facial sutures are shown. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. F1498; Pal. Mem. Pt. 5, No. 2, Pl. xxi., fig. 2).

*Phillipsia superba* Mitchell.

Fig. 15.—Cephalon minus the right free cheek. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. 24).

*Phillipsia waterhousei* Mitchell.

Figs. 16, 17, 18.—The first and second of these are from an intaglio, and the other is from a squeeze from it. With the aid of a lens, the features can be made out. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. Nos. 28 and 30).

## Plate xlix.

*Phillipsia woodwardi* Eth. fil.

Figs. 1-6.—Pygidia, all assumed to belong to this species. All show practically the same features. Figs. 3 and 4 are more strongly granulated than the others; but this difference probably arises from degrees of weathering. Fig. 5 was figured by Mr. Etheridge (*op. cit.* Pl. viii., fig. 6) as the normal tail of his *P. dubia*. (Coll. Geological Museum, Dept. of Mines, Brisbane. Nos. F 985, F 1024, F 995, F 1026, F 968, F 993).

Figs. 7-8.—Photos of a fragmentary cephalon, about which I am doubtful that it is rightly placed here. It is one of Mr. Etheridge's types (Geol. and Pal. Queensland and New Guinea, Pl. vii., fig. 13). (Coll. Geological Museum, Dept. of Mines, Brisbane. No. 967).

*Phillipsia rockhamptonensis* Mitchell.

Figs. 9-10.—Two prints of a nearly complete specimen. Fig. 10 has some of its features intensified. This specimen was figured by Mr. Etheridge, Junr., and determined to belong to his *P. dubia* (*op. cit.*, Pl. xlv., fig. 4). This figure very indifferently represents the original, as will be seen by comparing it with the present photos, which show its chief characteristic features clearly. (Coll. Queensland Museum, No. 716).

*Phillipsia morganensis* Mitchell.

Figs. 11-12.—Fig. 11 represents portions of a cephalon, thorax, pygidium, and a hypostome. Fig. 12 is a rough sketch of part of a cephalon. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. F 1000).

*Phillipsia woodwardi* Eth. fil.

Figs. 13-14.—Photos of the type-specimen. Fig. 14 has the outline traced in. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. 966).

*Brachymetopus dunstani* Mitchell.

Figs. 15-16.—Showing the cephalon and pygidium of the species. (Coll. Geological Museum, Dept. of Mines, Brisbane, No. F 1031; and Queensland Museum, Brisbane, No. 712).

## Plate l.

All figures, except 2 and 3, which are about nat. size,  $\times \frac{2}{3}$ .

*Phillipsia grandis* Eth. fil.

Figs. 1, 2, 3.—Photos of a pygidium. Figs. 2 and 3 are from casts of No. 1 in Fig. 1. Besides the pygidium, parts of at least three free cheeks, etc., are visible. One cheek shows within it the hypostome. The borders of these cheeks are remarkably large. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. F 927).

*Phillipsia elongata* Mitchell.

Figs. 4, 5, 6, 7.—Figs. 4 and 7 represent pygidia. Fig. 5 is a side-view of a very fine specimen, and shows, besides other features, the squatness of the eyes. Fig. 6, a pygidium and a portion of a head-shield. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. Nos. F 1496, 1500, and 1506).

*Phillipsia rockhamptonensis* Mitchell.

Figs. 8, 9.—Two pygidia. Fig. 8 is a photo of the specimen shown in Geol. and Pal. Queensland and New Guinea, Pl. xlv., fig. 6. Fig. 9 represents a young individual. (Coll. Queensland Museum, Brisbane, No. 833; and Geological Museum, Dept. of Mines, Brisbane, No. F 792).

*Phillipsia(?) woodwardi* Eth. fil.

Fig. 10.—On this specimen are several pygidia and a remarkable hypostome, doubtfully assumed to belong to this species; and, in addition, the greater part of a cheek of a *Brachymetopus*; the position of which is indicated by an arrow. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. 1007).

Fig. 11.—Glabella; one of Mr. Etheridge's types. (Coll. Queensland Museum, Brisbane. No. 707).

## Plate li.

If not otherwise indicated, all the figures are  $\times \frac{2}{3}$  (about).

*Phillipsia morgauensis* Mitchell.

Fig. 1.—A photo, in two sections, of a specimen on which are parts of at least three individuals, all assumed to belong to this species. The glabellar, pygidial, ocular, and hypostomal features are all discernible, as are also those of the thorax. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. F 1000).



*Phillipsia breviceps* Mitchell.

Figs. 2, 3.—Photo of a specimen showing portions of two cephalic-shields and a very perfect pygidium, whose characteristics are represented. Mark the peculiar contraction near the middle of the tail, which suggests a short tail, and a portion of a thorax. Fig. 3, a portion of a cephalon, showing limb, mesial furrow on the right, etc. (Coll. Mitchell).

*Phillipsia connollii* Mitchell.

Figs. 4-7.—A dorsal and side-view of the only pygidium known. The proportionately very wide border, prominent axis, granulation, and other features are fairly well shown. In Fig. 6, the axial and pleural divisions have been intensified slightly. (Coll. Geological and Mining Museum, Dept. of Mines, Sydney. No. F 1497).

*Phillipsia stanvellsensis* Mitchell.

Figs. 8-10.—Dorsal and side-view of a very perfect tail, and showing the very prominent, mildly serrated axis clearly. In this specimen, all the axial rings (12, doubtfully 13) are visible, as also are eight pleural segments, and the steep striated border. (Coll. Geological Museum, Dept. of Mines, Brisbane. No. F 977).

*Phillipsia stroudensis* Mitchell.

Fig. 11.—A medium-sized tail, having the dorsal part of the axis damaged; but otherwise exhibiting the normal features. (Coll. Mitchell).

*Phillipsia woodwardi* Eth. fil.

Figs. 12-13.—Portions of cephalons. Fig. 12 shows the glabellar furrows, strong neck-ring, and supplementary lobes, etc., very well. Fig. 13 exhibits these features less clearly. Fig. 12 is from the same specimen as that figured by Mr. Etheridge, Junr., (*op. cit.*, Pl. xlv., fig. 5). (Coll. Queensland Museum, Brisbane, No. 707; and Geological Museum, Dept. of Mines, Brisbane, No. F 1017).

*Phillipsia woodwardi*(?) Eth. fil.

Fig. 14.—This photo shows the fragments of trilobite-remains, on which Mr. Etheridge chiefly founded his species *G. seminiferus* var. *australasica*. On this specimen also occurs the tail of *Brachymetopus dunstani*. It remains to be proven that they are not portions of the above species. The tails shown on this specimen have the same number of axial and pleural divisions, and kind of granulation as those included with the cephalons of *P. woodwardi*. (Coll. Queensland Museum, Brisbane. No. 712).

## Plate lii.

*Phillipsia woodwardi*(?) Eth. fil., and *Brachymetopus dunstani* Mitchell.

Fig. 1.—This represents a portion of specimen No. 712 of the Queensland Museum, Brisbane. On it is the pygidium assumed to belong to *P. woodwardi*, and a pygidium of *Br. dunstani* in front of the arrow; ( $\times 3$ ).

*Brachymetopus dunstani* Mitchell, etc.

Fig.2.—Enlarged portion of specimen No. F 1017, Geological Museum, Dept. of Mines, Brisbane. On it is the intaglio of *Br. dunstani*, showing, fairly well, the chief specific features. The other pygidial and cephalic imprints are assumed to belong to *P. woodwardi* Eth. fil.; ( $\times 3$ ).

*Phillipsia superba* Mitchell.

Fig.3.—Head-shield ( $\times \frac{5}{2}$ ) from the same specimen as Pl. xlviii., fig.15.

*Phillipsia collinsi* Mitchell.

Fig.4.—A perfect tail of an immature individual; ( $\times \frac{5}{2}$ ).

*Griffithides convexicaudatus* Mitchell.

Figs.5, 6.—Tails about complete. Fig.5 is that of a young individual, but shows all the axial and pleural divisions.

*Phillipsia waterhousei* Mitchell.

Fig.7.—From a cast; it shows the glabellar furrows plainly; and other features.

## Plate liii.

*Griffithides(?) sweeti* Eth.fil.

Figs.1, 2.—Dorsal aspect. Traces of glabellar furrows are visible, especially on the right side generally. The important features are well shown. The photos are from the type-specimen; ( $\times 2$ ). (Coll. Sweet).

*Brachymetopus strzeleckii* McCoy.

Figs.3, 4.—Photos of the enlarged figures of McCoy (*loc. cit.*).

Figs.5, 6.—Photos of Reed's figures of the species (*loc. cit.*).

*Griffithides dubius* Eth. Semr.

Fig.7.—Copy of the figure given by R. Etheridge, Junr., (in Geol. Pal. Queensland and New Guinea, 1892, Pl. vii., fig.12).

*Phillipsia woodwardi* Eth.fil.

Figs.8, 9.—Copies of Mr. Etheridge's figures (*op. cit.*, Pl. vii., figs.13, 15).

*Griffithides(?) seminiferus* var. *australasica*.

Fig.10.—Copy of Mr. Etheridge's original figure of a free cheek.